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ABSTRACT

The Minnesota Talented Youth Mathematics Project (MTYMP) aimed to accelerate the mathematics learning of extremely talented junior high school pupils in special fast-paced classes outside of the regular school program. During the 1976-77 school year, 65 pupils from Duluth, St. Paul, and Minneapolis, Minnesota earned credit in Algebra I and II. This evaluation report discusses findings and recommendations in five areas: the effectiveness of the talent search, students' readiness to study algebra, algebra achievement, affective student characteristics, and the learning environment of the program. The Cooperative School and College Ability Tests (SCAT) were used to successfully identify the participants. The Minneapolis Public Schools Minimum Essentials Test was used to identify any introductory topics which needed development in class before proceeding with the algebra curriculum. The Cooperative Mathematics Tests: Algebra I and II, were selected for granting credit in algebra; all of the students attained the 88th percentile. The Mathematics Attitude Inventory showed decreases in self concept and motivation, and increases in students' perceptions of the value of mathematics and in anxiety. The Learning Environment Inventory indicated that the pupils viewed their classes as fast-paced, difficult and goal-directed, providing for individual needs and interests; and that the students were satisfied with the class. (Author/BW)

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Minnesota Talented Youth Mathematics Project:

Evaluation Report, 1976-77

Minnesota State Department of Education
St. Paul, Minnesota

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Introduction

Recently, educators have expressed renewed interest in providing for the special needs of gifted and talented students. Professional journals have published articles calling attention to the importance of gifted education, and several projects have been developed and implemented in a number of states. In the area of mathematics, the most extensive program for talented students is the Study of Mathematically Precocious Youth (SMPY) directed by Professor Julian Stanley at Johns Hopkins University (see Stanley, Keating and Fox, 1974; Keating, 1976). Until the 1976-77 academic year there had been no replication of the SMPY, but in September 1976 the Minnesota State Department of Education initiated such a replication through the Minnesota Talented Youth Mathematics Project (MTYMP). The following is a report of the results of the first year of that program.

Initiation of the MTYMP

The MTYMP is one phase of the Minnesota Component of the Multi-State Proposal for Gifted and Talented Students which is funded by Public Law 93:380. (The other component is the Minnesota Gifted Education Masters Program.) The MTYMP is under the supervision of Lorraine Hertz, Gifted Education Coordinator, Minnesota State Department of Education. Steven Watson, a teacher in the St. Paul Public Schools, is part-time project director.

Receipt of the $11,716 federal grant was announced in September 1976, and organization of the MTYMP began immediately. Nine Minnesota educators accepted invitations to meet with the State Department consultant, the project director, and William George, associate director of the SMPY, for an organizational meeting on September 9. At that time, an Advisory Committee (see Appendix A) was formed to determine policy for the MTYMP, to select the MTYMP teachers, and to assist in pupil selection and program implementation.

Goals of the MTYMP

The general goal of the MTYMP was to accelerate the mathematics learning of extremely gifted junior high school students by providing the opportunity to complete two years of high school algebra in one of three special fast paced classes meeting once a week for two hours for thirty weeks. Three classes of 25 students each would be formed, two in the Twin Cities metropolitan area (hereafter designated MTYMP-TC) and one in Duluth (MTYMP-D). The population of primary interest was seventh and eight graders, but this was later extended to include ninth graders who had not yet completed Algebra I. In addressing itself to this goal, the Advisory Committee focused on six-principal issues: teacher selection, the talent search, participant selection, curriculum and classroom procedures, arrangements with home schools, and communications with parents. A summary of the specific goals and guidelines in each of these areas is given below.

Overview of Program Guidelines

Teacher Qualifications and Selection

The selection of highly qualified teachers for the MTYMP classes was given high priority by the Advisory Committee. The Committee determined that these should be secondary school mathematics teachers and that interested persons should apply for the positions. No potential teachers would be solicited by the Committee. Accordingly, position notices were mailed to the Mathematics Department Chairpersons of all junior and senior high schools in the nine county Twin Cities area and in the Duluth area. (See Appendix C.) Criteria for teacher selection determined by the Committee were announced to be the following:

1. Successfully experienced in a variety of secondary math positions and possessing the ability to use several different instructional methods.

2. Enthusiastic about teaching mathematics, not threatened by bright and talented youngsters, and strongly motivated intellectually.

3. Desire to spend the time required to perform the job.

4. Ability to teach a mathematics curriculum which may well include Algebra I, Algebra II, and plane geometry in approximately 60 hours.

5. Knowledgeable about available math resource people and curriculum materials and possessing the ability to successfully tap those resources.

6. Experienced in teaching mathematically talented students and possessing the ability to relate to these students.

Twenty-nine teachers applied for the three positions. Twenty of the applications were for the MTYMP-TC classes; hence, the number of applicants in the two areas was proportionate to the number of positions available.

Applications were screened by the entire Advisory Committee, and finalists were brought forward for interviews by a panal of Advisory Committee members. Upon recommendations from the interviewers, three MTYMP teachers were named: Eunice Kanning and Larry Luck, both teachers in the Minneapolis Public Schools, and Lynn Durward, a teacher in the Duluth Public Schools.

In addition, three teaching assistants were hired to assist the teachers with paper grading, record keeping, individual student help, and other classroom duties.

Talent Search

The identification and selection of the MTYMP students began with a talent search during which qualified students were given a difficult test of mathematical ability. As demonstrated by Stanley in the SMPY, ability tests designed for the students' respective grade levels are inadequate for extremely gifted pupils because the ceilings on such tests are too low. Hence, they fail to discriminate between pupils who score at the extreme of the distribution even though two pupils scoring at the 99th percentile may, in reality, be quite different from each other. However, ability tests designed for senior high school or college students have been effective in helping to identify the extremely talented.

For purposes of the MTYMP, a score at or above the 97th percentile on an in-grade, standardized test of mathematical achievement or ability made the pupil eligible to participate in the talent search. Announcements of the talent search (see Appendix C) were mailed to all junior high school principals, all junior high school counselors, and all junior high school Mathematics Department chairpersons in the Twin Cities and Duluth areas and to the principals of all parochial (usually grades 1-8) and private schools in the two locations. Schools which nominated talent search participants were required to furnish qualifying test scores for each pupil. As with the teacher search, all applications were initiated by the schools or by individual pupils and their parents. No pupils were sought out by the Committee.

The test selected for the talent search was the School and College Ability Test (SCAT), Series II, Form 2A (Educational Testing Service, 1973). This test, intended for grades 9-12, consists of two parts: quantitative (SCAT-Q) and verbal (SCAT-V). Two administrations of the test were scheduled in the Twin Cities (October 2 and 7) and one in Duluth (October 16). All testing was done on Saturday mornings or after school. Results of the talent search are presented in a later section of this report.

Participant Selection

Seventy-five students could be selected for the three classes. Pupils were ranked first by their SCAT-Q score and second, within each SCAT-Q score range, by their SCAT-V score, and the top scoring pupils were named as potential participants or alternates. Examination of the top scores from the Twin Cities showed that approximately half were earned by ninth graders. On the basis of this result, the two Twin Cities classes were designated to be one class of ninth graders (MTYMP-TC 9) and one of seventh and eighth graders (MTYMP-TC 7/8). The Duluth class included all three grade levels.

Of particular concern to the Advisory Committee was the participation in MTYMP by qualified girls. The number of females who study mathematics declines sharply after the junior high school years, and the Committee hoped that MTYMP would provide encouragement to mathematically talented girls. Thus, if decisions were necessary between pupils with equal scores, consideration was given to girls in the talent pool.

Curriculum and Classroom Procedures

Fast paced classes in the SMPY have covered Algebra I, Algebra II, and geometry during the summer or academic year, but the MTYMP Committee rejected this as too much content for adequate treatment in 30 weeks. Instead, the content was determined to be Algebra I and II. The Committee chose to make more specific curricular decisions in consultation with the MTYMP teachers.

After consulting with the teachers and reviewing possible course texts, the Scott, Foresman books Algebra One and Algebra Two (1976, 1977) were selected for the MTYMP. Student editions of both volumes for each MTYMP student and teacher editions for the MTYMP teachers and for each home school mathematics teacher were provided by Scott, Foresman. The MTYMP teachers determined the order of topics and the instructional

procedures to be used. In general they integrated the content of Algebra I and II rather than proceeding in a sequential manner through the texts. The specific topics covered during each ten weeks of the program are reported later. Other expectations and guidelines relating to classroom procedure and testing are included in Appendix B.

A related policy matter was the determination of criteria for granting credit for successful completion of the course. State Department of Education requirements for secondary school mathematics as related to the MTYMP students appear in Appendix B. To demonstrate mastery of Algebra I and II, students would be required to pass standardized achievement tests. The Committee selected the Cooperative Mathematics Tests (Educational Testing Service, 1964) of Algebra I (COOP-I) and Algebra II (COOP-II) for this purpose, and they designated the 88th percentile on national norms as the minimum for credit in each subject. These requirements were communicated to the home schools in a set of policy guidelines (see Appendix B).

Another State Department of Education regulation stated that classes could not be held on Saturdays. Hence, MTYMP classes were scheduled to meet after school one day a week. Parents and students in all three classes favored Thursdays, so all three classes met on that day. MTYMP-TC classes were held from 4 to 6 p.m. in facilities provided by Hamline University in St. Paul; MTYMP-D classes met from 6 to 8 p.m. at Ordean Junior High School.

Arrangements with Home Schools

Students in the MTYMP were given lengthy assignments and required to complete a considerable amount of mathematics during the week. Thus it was necessary to provide them with time for this during the school day. Further, students in the MTYMP were not to be required to take the regular seventh or eighth grade mathematics course since they had already demonstrated mastery well beyond that level. These concerns were reflected in a set of policy guidelines sent to all home schools, (see Appendix B). In addition, two dinner meetings, one in Fall and one in Spring, gave home school mathematics teachers an opportunity to discuss the program with the directors and Advisory Committee.

Communication with Parents

Parents were informed of the goals and expectations of the program in an orientation meeting for parents, students and Advisory Committee prior to the first class. Each received a copy of the guidelines for parents and students (Appendix B), and each gave written consent for the child's participation (Appendix C). Three written progress reports were sent during the year (Appendix C), and parents were given the home telephone numbers of the MTYMP teachers. Also, the project director was available at Hamline University during all meetings of the Twin Cities classes.

Focus of the Evaluation

The goals of the MTYMP and the concerns of the Advisory Committee generated several questions which were important in determining the success of the first year of the MTYMP and in planning for subsequent programs. These questions which are the focus of this evaluation report were as follows:

1. How effective was the talent search in identifying mathematically talented pupils?

2. What were the entry characteristics of MTYMP participants? Were they ready for an intensive, accelerated treatment of algebra?

3. How well did they achieve in the learning of algebra?

4. Was the program effective in maintaining and enhancing positive attitudes toward mathematics and toward self?

5. What was the learning environment in the MTYMP?

6. What happened to the participants after MTYMP?

The remainder of this report presents findings relative to the questions above. Data were taken primarily from the two Twin Cities classes. Information on the Duluth program is included where possible, but data on Duluth participants were incomplete in some cases resulting in a more limited assessment for that class on some of the questions of concern.

Effectiveness of the Talent Search

The purpose of the talent search was to identify highly capable mathematics students. Questions of particular concern are:

1. Was the talent search effective in bringing forth potential MTYMP participants?

2. Was the SCAT an effective instrument for participant selection?

3. Could the talent search be limited to seventh and eighth grade students as originally planned?

4. Were females appropriately represented among students in the talent search?

Success of Talent Search

A total of 527 students participated in the Twin Cities talent search. The distribution of participants by sex and grade level is shown in Table 1. In addition, approximately 150 students took the SCAT test in Duluth.

The 527 Twin Cities pupils represented 72 junior high schools: 50 public schools in 27 public school districts, 21 Catholic schools in the Archdiocese of St. Paul-Minneapolis, and one private school. The numbers of pupils per school, which ranged from one to 49, are summarized in Table 2.

Table 1
MTYMP 1976 Talent Search
Twin Cities
Participation by Individuals

	Grade 7			Grade 8			Grade 9			Totals		
	Girls	Boys	Total	Girls	Boys	Total	Girls	Boys	Total	Girls	Boys	Total
MTYMP Participants	2	7	9	4	12	16	6	17	23	12	36	48
Non Participants	79	99	178	115	107	222	43	36	79	237	242	479
Qualified but did not accept		1	1	1	5	6	3	3	6	4	9	13
Alternates, not invited to participate		2	2	6	15	21	4	9	13	10	26	36
Non-selected	79	96	175	108	87	195	36	24	60	223	207	430
Totals in Talent Search	81	106	187	119	119	238	49	53	102	249	278	527

Table 2
MTYMP 1976 Talent Search
Twin Cities
Participation by Schools

Number of Participants Per School	Number of Schools
1	22
2	11
3-5	10
6-10	11
11-15	7
16-20	4
21-25	4
26-30	2
.	.
.	.
.	.
46-50	1

The State Department of Education consultant reported that announcements of the talent search were sent to approximately 220 public and nonpublic schools. Hence, only about one-third of the schools responded to the notice. One reason for this was the short time between the announcement of the talent search and the SCAT administration, an unavoidable situation brought about by receipt of funding after the beginning of the school year.

In addition, it should be noted that seven schools (10 percent) accounted for 192 pupils or 36 percent of the talent search participants. Of the 22 schools with only one participant, ten were parochial or private schools with comparatively limited enrollments. Further, parochial schools did not include ninth grade. The project director also reported that in several cases with one or two representatives from a school, these students came to the talent search through direct contact from the parents to the project director rather than through the school counselor or teacher.

The 48 MTYMP-TC participants came from 24 schools: 20 public schools in 17 districts and four Catholic schools. Thirteen schools had two or more participants as follows:

7 schools with 2 students each
3 schools with 3 students each
2 schools with 4 students each
1 school with 6 students

In Duluth, 17 students completed the program. They came from one Catholic and eight public schools with one to four participants per school. The home schools of participants are listed in Appendix D.

Based upon the number of students tested, the first Minnesota Talent Search was judged by the MTYMP Committee to have been a success. It is anticipated that future talent searches would be given broader advanced publicity and would attract even larger numbers.

Appropriateness of the SCAT

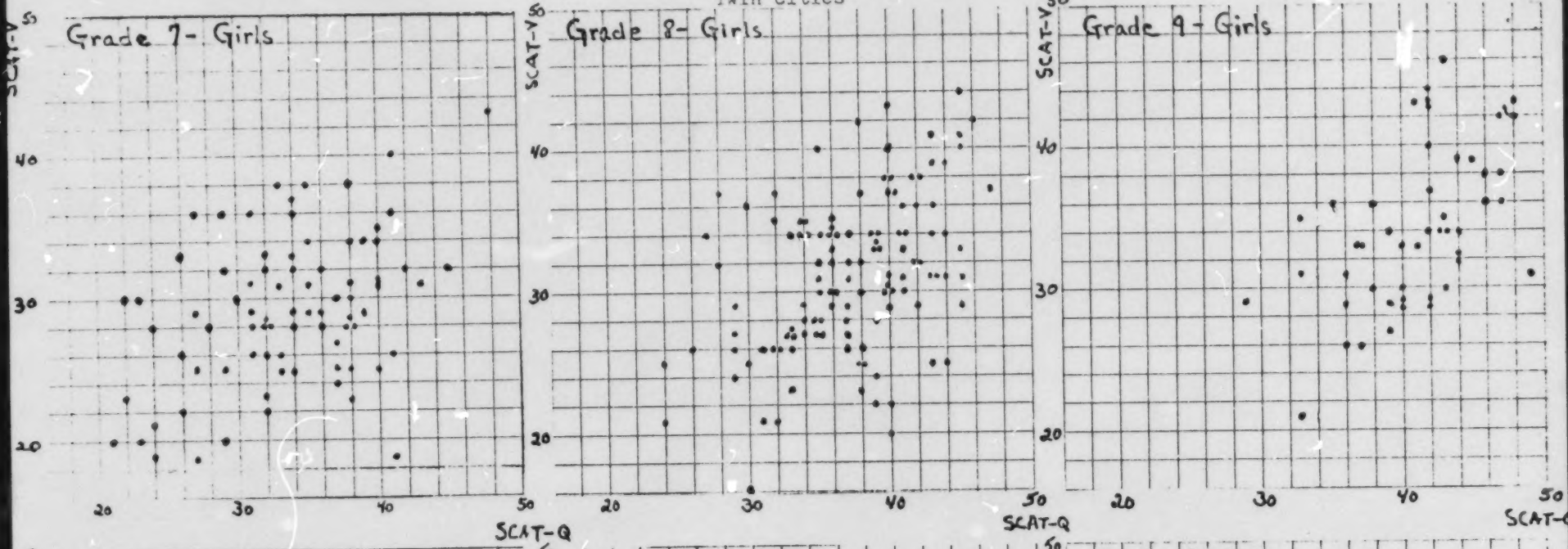
The SCAT is designed to predict academic performance. Form 2A is intended for grades 9 through 12. It consists of two parts, quantitative and verbal, each containing 50 items to be completed in 20 minutes. SCAT-Q items involve quantitative comparisons; SCAT-V consists of analogy items. The reliability and validity characteristics and complete data on appropriate norms are reported in the SCAT Handbook (Educational Testing Service, 1973) and will not be repeated here since the SCAT is a well known and widely accepted test.

The maximum raw score on each part of the SCAT is 50, or the number of items answered correctly. Figure 1 shows a plot of the SCAT-Q vs. SCAT-V scores of participants in the Twin Cities talent search. The highest scoring pupils had SCAT-Q scores of 49; the highest SCAT-V score was 45. Figure 2 shows the scores of the 48 MTYMP-TC pupils and of the 17 who completed the MTYMP-D program.

Figure 1

SCAT Scores of Talent Search Participants

Twin Cities



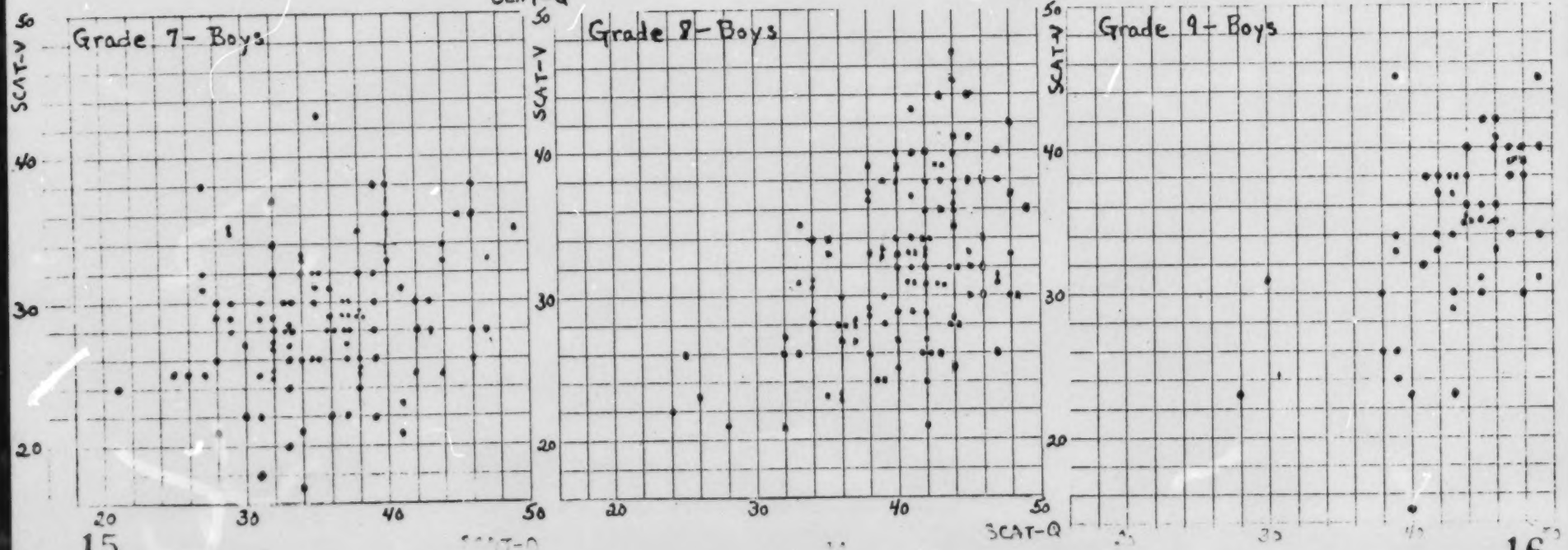
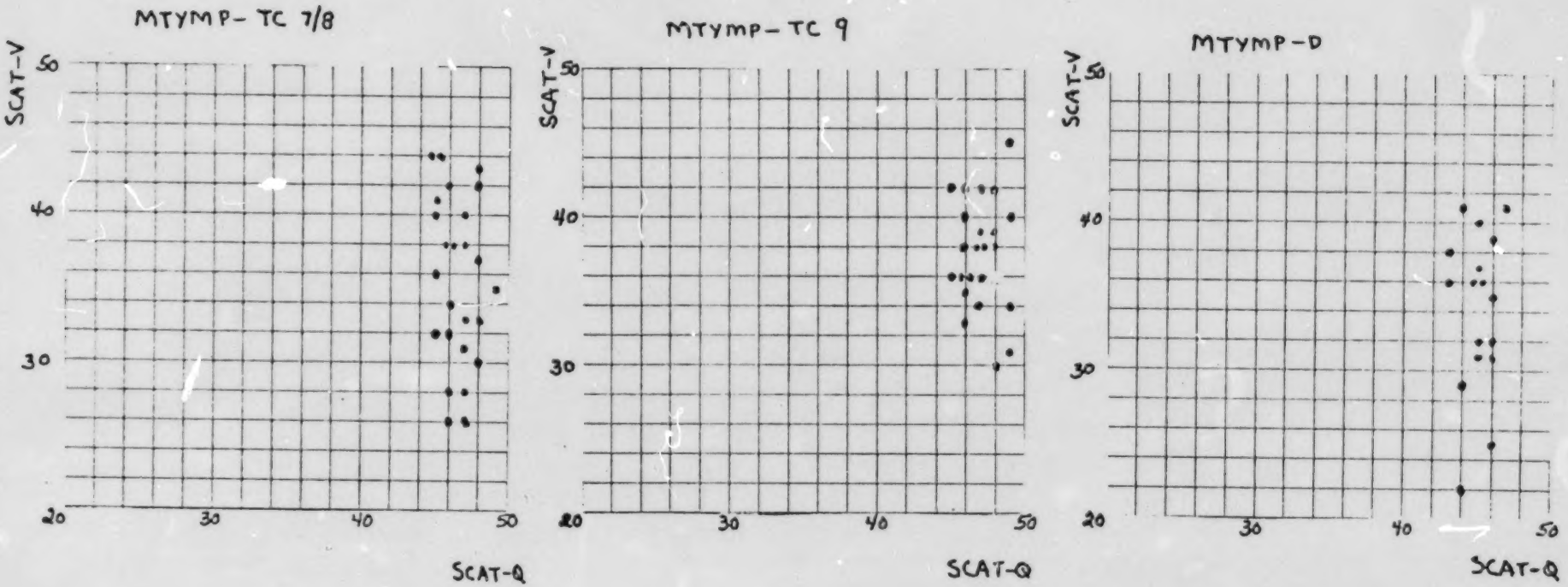


Figure 2

SCAT Scores of MTYMP Pupils



Raw scores on the SCAT can be translated into converted scores which permit comparisons of student performance on alternate forms of the SCAT and on SCAT tests designed for various grade levels. Table 3 shows the converted scores for the SCAT-Q scores of MTYMP participants and the percentile equivalents for college bound students in the spring of ninth grade or fall of tenth grade (9S-10F). Tables 4 and 5 give similar information for selected points within the range of SCAT-V and SCAT-Total scores of MTYMP pupils. The data in all three tables are taken from the SCAT Handbook.

As evidenced from the scattergrams in Figures 1 and 2, the SCAT test did achieve the desired objective of differentiating among the highly gifted pupils in the talent search. Further, Tables 3 through 5 indicate that the 68 MTYMP participants were highly gifted in mathematical and overall ability even as compared to college bound pupils one to three years older. Table 6 further illustrates the ability of the MTYMP pupils as compared to their age peers and to students through the second year of college.

According to the SCAT Handbook (p. 73), pupils' SCAT-Q and SCAT-V scores are judged to indicate a real difference in the two abilities only if the corresponding percentile bands do not overlap. In the total population, it is expected that approximately 40 percent of individuals would appear to be different in mathematical and verbal ability and that this estimate is made with approximately 95 percent accuracy. Examination of the paired scores (SCAT-Q, SCAT-V) of the MTYMP pupils indicates that 17 of 25 (68 percent) in the MTYMP-TC 7/8, 17 of 23 (74 percent) in the MTYMP-TC 9, and 12 of 17 (71 percent) in the MTYMP-D groups showed differences in the two abilities. In every case the mathematical ability was higher. This can be taken as further evidence that the SCAT test was effective in identifying the desired pupils.

The results reported above support the appropriateness of the talent search procedures for identifying mathematically talented pupils. A second dimension of the evaluation of the selection process, however, is the question of how well the selection criteria predicted success in the program. To answer this question, a multiple regression analysis was performed. This technique uses two or more variables to predict the value of a single criterion. In the present case, the variables used as predictors were the SCAT-Q and SCAT-V scores and the sex of the student. The criterion to be predicted was achievement in Algebra I and II as measured by the COOP score. For each class, the analysis was first performed using the COOP-I score, then repeated for the COOP-II.

The multiple regression analysis proceeded as follows: First, the three predictor variables were used to generate a regression equation of the form

$$Y = b_1X_1 + b_2X_2 + b_3X_3 + c$$

and the regression coefficients (b_1, b_2, b_3) and constant (c) were determined. This equation is referred to as the full model equation. Next, the F-statistic was calculated for the hypothesis of no relationship for the full model equation, and the F value was tested for significance. A determination that F is significant indicates that the three predictor equation can be used to predict algebra achievement as measured by scores on COOP-I or COOP-II.

Table 3
Individual SCAT-Q Norms for College Bound Students
Grades 9S-10F
and Scores Earned by MTYMP Students

Scores		Percentile	Percentile	Number of MTYMP Scores*		
Raw	Converted	Band	Mean	MTYMP-TC 7/8	MTYMP-TC 9	MTYMP-D
49	510	99-99+	99+	1	4	
48	507	99-99+	99+	5	4	
47	505	98-99+	99+	6	6	1
46	503	98-99+	99	7	7	5
45	500	95-99	98	6	2	6
44	498	92-98	96			3
43	496	88-98	94			2

*Number of MTYMP students earning the given score

Table 4
Individual SCAT-V Norms for College Bound Students
Grades 9S-10F
and Scores Earned by MTYMP Students

Scores		Percentile	Percentile	MTYMP Scores--Cummulative Frequency*		
Raw	Converted	Band	Mean	MTYMP-TC 7/8	MTYMP-TC 9	MTYMP-D
45	489	99-99+	99+		1	
40	481	89-98	95	8	7	3
35	471	64-87	77	14	18	10
30	461	37-64	50	21	23	14
25	451	17-37	26	25	23	16

*Number of MTYMP students earning the given score or higher

Table 5
Individual SCAT-Total Norms for College Bound Students
Grades 9S-10F
and Scores Earned by MTYMP Students

Scores		Percentile	Percentile	MTYMP Scores--Cummulative Frequency*		
Raw	Converted	Band	Mean	MTYMP-TC 7/8	MTYMP-TC 9	MTYMP-D
94	499	99-99+	99+		1	
90	495	99-99+	99+	2	2	
85	489	94-99	98	10	12	4
80	484	86-97	93	17	21	9
75	479	74-91	84	22	23	14
70	474	57-84	72	25	23	16

*Number of MTYMP students earning the given score or higher

Table 6
Individual Norms for Students Grades 7 through 14*
(Percentiles)

Grade:	All Students							College Bound				College	
	6S-7F	7S-8F	8S-9F	9S-10F	10S-11F	11S-12F	12S	9S-10F	10S-11F	11S-12F	12S	13F	14S
SCAT-Q													
Converted Score													
510				99+	99+	99+	99+	99+	99+	99+	99	97	96
505	99+	99+	99+	99+	99	98	97	99+	98	97	96	92	90
498	99+	99+	99	97	95	93	90	96	93	88	85	84	78
Mean	448	456	462	468	471	474	476	474	478	481	482	479	484
Standard Deviation	15	17	18	18	18	18	18	16	16	16	16	18	17
75 percentile	460	469	476	482	485	488	490	486	490	492	494	492	496
50 percentile	447	457	463	468	473	476	478	476	479	483	485	480	485
25 percentile	436	443	449	454	459	461	463	463	468	471	473	468	473
SCAT-V													
Converted Score													
489	99+	99+	99+	99+	99	98	97	99+	99	97	96	86	80
467	98	93	86	77	68	58	50	67	56	43	35	36	25
444	67	49	37	27	20	15	11	15	9	6	4	8	4
Mean	438	444	449	454	458	462	465	459	464	468	470	471	476
Standard Deviation	15	16	16	16	16	17	16	15	14	14	14	17	16
75 percentile	448	456	461	466	470	474	477	470	474	478	481	482	487
50 percentile	437	444	450	455	460	464	467	461	465	469	472	473	478
25 percentile	427	433	438	442	448	452	456	451	455	460	463	461	467
SCAT-Total													
Converted Score													
499	99+	99+	99+	99+	99+	99+	99+	99+	99+	99+	99	95	94
485	99+	99+	99	96	93	88	84	94	89	81	76	74	64
470	98	92	84	72	63	54	48	60	48	36	31	37	27
Mean	445	451	456	460	464	467	469	465	469	473	475	474	479
Standard Deviation	12	13	14	15	15	16	15	14	13	13	13	16	14
75 percentile	454	460	466	471	475	479	481	475	479	483	485	485	490
50 percentile	444	451	456	461	465	468	471	467	471	475	477	475	480
25 percentile	435	441	446	449	453	456	459	457	461	465	467	464	469

*From SCAT Handbook, Educational Testing Service, 1973

After the full model equation was determined, a new equation, called the restricted model, was formed using as predictors only one or two of the variables which appeared to weigh heaviest in the full model. Again, the F-statistic for the hypothesis of no relationship was calculated and tested for significance. Also, the F-statistic was calculated for the hypothesis of no difference between the full model and the restricted model, and this F was tested for significance. A determination of non-significance indicates that the full model does not predict significantly better than the restricted model, and suggests that the variables in the restricted model alone can be used as predictors of achievement.

Finally, the multiple R and R^2 were calculated for each case. The R value is the multiple correlation coefficient, and R^2 represents the proportion of the variance of the dependent variable, in this case achievement in algebra as measured on the COOP test, which is accounted for by the predictor variables.

The results of these analysis of regression are reported in Tables 7 through 9. They show that for both MTYMP-TC groups, the SCAT-Q measure was significant ($p < .01$ to $p < .05$) in predicting success in Algebra II. For the ninth graders, SCAT-Q scores also predicted success in Algebra I ($p < .05$), but there were no significant predictors for Algebra I in the seventh and eighth grade group. The results for the MTYMP-D class did not reach significance.

It also seemed possible that grade level (seventh vs. eighth) might be significant in algebra achievement since eighth graders would have completed an additional year of preparatory mathematics. Therefore, the regression analysis described above was repeated for the MTYMP-TC 7/8 and MTYMP-D classes using the SCAT-Q and SCAT-V scores and grade level as predictors. Since sex had not been significant in the earlier analysis, it was not included. These results are given in Tables 10 and 11. Again, SCAT-Q alone was significant ($p < .01$) in predicting achievement in Algebra II for the MTYMP-TC 7/8 group. Other predictions failed to reach significance.

The above results indicate a relationship between mathematical ability as measured by SCAT-Q and success in the MTYMP class. They further support the Advisory Committee's decision to select participants by SCAT-Q performance. The correlations among all the variables considered above are reported in Tables 12 through 14.

Limiting the Talent Search to Grades 7 and 8

The initial intent of the MTYMP was to provide the fast paced algebra classes for seventh and eighth grade students since they have more limited opportunities to study algebra in their home schools. Ninth graders, on the other hand, especially talented ninth graders, probably would be enrolled in algebra as their regular mathematics course. However, there was uncertainty on the part of the Committee as to whether the talent search would attract a sufficient pool of perspective participants if limited to seventh and eighth grades. Thus, the decision was made to include ninth graders in the program.

Table 7
Multiple Regression Analysis for MTYMP-TC 7/8
Using SCAT-Q, SCAT-V and Sex

	Full Model	Restricted Models			Full Model	Restricted Models		
Predictors: (Regression coefficients in parentheses)	SCAT-Q (0.38) SCAT-V (0.05) Sex (1.40) (C = 18.24)	SCAT-Q SCAT-V	SCAT-Q Sex	SCAT-Q	SCAT-Q (2.04) SCAT-V (-0.18) Sex (3.81) (C = -54.05)	SCAT-Q SCAT-V	SCAT-Q Sex	SCAT-Q
Criterion:	COOP-I	COOP-I	COOP-I	COOP-I	COOP-II	COOP-II	COOP-II	COOP-II
N:	25	25	25	25	24	24	24	24
R:	0.33	0.21	0.29	0.12	0.65	0.63	0.61	0.59
R^2:	0.11	0.04	0.08	0.01	0.42	0.40	0.37	0.35
Test of no relation:								
F:	0.87	0.48	1.00	0.34	4.88	7.06	6.18	11.83
df:	(3,21)	(2,22)	(2,22)	(1,23)	(3,20)	(2,21)	(2,21)	(1,22)
Significance:	none	none	none	none	$p < .05$	$p < .01$	$p < .01$	$p < .01$
Test of no difference:								
F:						vs. Full	vs. Full	vs. Full
df:						0.72	1.82	1.27
Significance:						(1,20)	(1,20)	(2,20)
						none	none	none

Table 8
Multiple Regression Analysis for MTYMP-TC 9
Using SCAT-Q, SCAT-V and Sex

	Full Model	Restricted Models			Full Model	Restricted Models		
Predictors: (Regression coefficients in parentheses)	SCAT-Q (0.83) SCAT-V (0.10) Sex (0.16) (C = -6.24)	SCAT-Q SCAT-V	SCAT-Q Sex	SCAT-Q	SCAT-Q (1.28) SCAT-V (0.36) Sex (-1.62) (C = -39.58)	SCAT-Q SCAT-V	SCAT-Q Sex	SCAT-Q
Criterion:	COOP-I	COOP-I	COOP-I	COOP-I	COOP-II	COOP-II	COOP-II	COOP-II
N:	23	23	23	23	23	23	23	23
R:	0.55	0.55	0.52	0.52	0.59	0.56	0.48	0.44
R^2:	0.30	0.30	0.27	0.27	0.35	0.31	0.23	0.20
Test of no relation:								
F:	2.75	4.34	3.70	7.75	3.36	4.52	3.00	5.10
df:	(3,19)	(2,20)	(2,20)	(1,21)	(3,19)	(2,20)	(2,20)	(1,21)
Significance:	none	$p < .05$	$p < .05$	$p < .05$	$p < .05$	$p < .05$	none	$p < .05$
Test of no difference:		vs. Full	vs. Full	vs. Full		vs. Full		vs. Full
F:		0.02	0.91	0.46		1.02		2.20
df:		(1,19)	(1,19)	(2,19)		(1,19)		(2,19)
Significance:		none	none	none		none		none

Table 9
Multiple Regression Analysis for MTYMP-D
Using SCAT-Q, SCAT-V and Sex

	Full Model	Restricted Models			Full Model	Restricted Models		
Predictors: (regression coefficients in parentheses)	SCAT-Q (0.86) SCAT-V (-0.03) Sex (-1.48) (C = -1.30)	SCAT-Q SCAT-V	SCAT-Q Sex	SCAT-Q	SCAT-Q (1.27) SCAT-V (0.03) Sex (1.80) (C = -24.79)	SCAT-Q SCAT-V	SCAT-Q Sex	SCAT-Q
Criterion:	COOP-I	COOP-I	COOP-I	COOP-I	COOP-II	COOP-II	COOP-II	COOP-II
N:	17	17	17	17	17	17	17	17
R:	0.45	0.37	0.44	0.37	0.46	0.43	0.45	0.43
R^2:	0.20	0.14	0.20	0.13	0.21	0.19	0.21	0.18
Test of no relation:								
F:	1.07	1.11	1.71	2.33	1.16	1.62	1.82	3.39
df:	(3,13)	(2,14)	(2,14)	(1,15)	(3,13)	(2,14)	(2,14)	(1,15)
Significance:	none	none	none	none	none	none	none	none
Test of no difference:								
F:								
df:								
Significance:								

Table 10
Multiple Regression Analysis for MTYMP-TC 7/8
Using SCAT-Q, SCAT-V and Grade

	Full Model	Restricted Models			Full Model	Restricted Models		
Predictors: (Regression coefficients in parentheses)	SCAT-Q (0.22) SCAT-V (0.12) Grade (0.90) (C = 23.20)	SCAT-Q SCAT-V	SCAT-Q Grade	SCAT-Q	SCAT-Q (1.56) SCAT-V (-0.07) Grade (-0.61) (C = -34.51)	SCAT-Q SCAT-V	SCAT-Q Grade	SCAT-Q
Criterion:	COOP-I	COOP-I	COOP-I	COOP-I	COOP-II	COOP-II	COOP-II	COOP-II
N:	25	25	25	25	24	24	24	24
R:	0.31	0.27	0.17	0.09	0.54	0.54	0.52	0.52
R^2:	0.09	0.07	0.03	0.01	0.29	0.29	0.27	0.27
Test of no relation:								
F:	0.73	0.85	0.33	0.20	2.72	4.24	3.87	8.03
df:	(3,21)	(2,22)	(2,22)	(1,23)	(3,20)	(2,21)	(2,21)	(1,22)
Signficance:	none	none	none	none	none	$p < .05$	$p < .05$	$p < .01$
Test of no difference:						vs. Full	vs. Full	vs. Full
F						0.05	0.57	0.31
df:						(1,20)	(1,20)	(2,20)
Significance:						none	none	none

Table 11
Multiple Regression Analysis for MTYMP-D
Using SCAT-Q, SCAT-V and Grade

	Full Model	Restricted Models			Full Model	Restricted Models		
Predictors: (Regression coefficients in parentheses)	SCAT-Q (0.99) SCAT-V (-0.04) Grade (-0.50) (C = -7.04)	SCAT-Q SCAT-V	SCAT-Q Grade	SCAT-Q	SCAT-Q (1.15) SCAT-V (0.06) Grade (1.20) (C = -20.17)	SCAT-Q SCAT-V	SCAT-Q Grade	SCAT-Q
Criterion:	COOP-I	COOP-I	COOP-I	COOP-I	COOP-II	COOP-II	COOP-II	COOP-II
N:	17	17	17	17	17	17	17	17
R:	0.41	0.40	0.41	0.39	0.46	0.42	0.45	0.41
R^2:	0.17	0.16	0.17	0.15	0.21	0.17	0.20	0.17
Test of no relation:								
F:	0.89	1.31	1.41	2.75	1.14	1.48	1.76	3.00
df:	(3,13)	(2,14)	(2,14)	(1,15)	(3,13)	(2,14)	(2,14)	(1,15)
Significance:	none	none	none	none	none	none	none	none
Test of no difference:								
F:								
df:								
Significance:								

Table 12
Correlation Matrix for MTYMP-TC 7/8

	SCAT-Q	SCAT-V	COOP-I	COOP-II	Sex*	Grade**
SCAT-Q	1.00					
SCAT-V	-0.18	1.00				
COOP-I	0.19[1]	0.22	1.00			
COOP-II	0.53[2]	-0.20[3]	0.26	1.00		
Sex*	-0.41[2]	0.48[3]	0.25	0.05	1.00	
Grade**	0.02	-0.33	0.10	-0.02	-0.03	1.00

* Positive correlations favor females
**Positive correlations favor seventh grade
(1)p < .01 (2)p < .05 (3)p < .02 two-tail tests

Table 13
Correlation Matrix for MTYMP-TC 9

	SCAT-Q	SCAT-V	COOP-I	COOP-II	Sex*
SCAT-Q	1.00				
SCAT-V	-0.04[1]	1.00			
COOP-I	0.51[2]	0.18	1.00		
COOP-II	0.44[2]	0.31	0.20	1.00	
Sex*	-0.10	0.18	0.02	-0.18	1.00

* Positive correlations favor females
(1)p < .02 (2)p < .05 two-tail tests

Table 14
Correlation Matrix for MTYMP-D

	SCAT-Q	SCAT-V	COOP-I	COOP-II	Sex*	Grade**
SCAT-Q	1.00					
SCAT-V	0.04	1.00				
COOP-I	0.40	-0.04	1.00[1]			
COOP-II	0.40	0.07	0.53[1]	1.00		
Sex*	-0.28	-0.02	-0.30	0.10	1.00	
Grade**	-0.10	-0.27	-0.12	0.16	-0.34	1.00

* Positive correlations favor females
**Positive correlations favor lower grade level
(1)p <.05 two-tail test

Table 15 presents a summary of the SCAT-Q scores of seventh and eighth grade pupils in the Twin Cities who scored above 45 but chose not to participate or who scored between 43 and 45 and were not included. Fifty-four students fell into this category, enough for two additional classes. The successful participation in the MTYMP-D program by pupils with SCAT-Q scores of 43 and 44 indicates that such a qualifying score is not too low for the program. It would not appear to be necessary to include ninth graders if the program directors still prefer to focus the MTYMP on the earlier grades.

Females in MTYMP

As reported earlier in Table 1, 249 girls took part in the Twin Cities testing. They represented 47 percent of the total talent search. Percentages of girls by grade level were as follows:

Grade 7	43 percent
Grade 8	50 percent
Grade 9	48 percent

However, the percentage of girls in the MTYMP-TC program dropped to 25 percent. Only three of the 17 (18 percent) completing the MTYMP-D program were girls. Hence, the number of girls in the MTYMP classes was not proportionate to the number in the talent search.

Data reported in the SCAT Handbook indicate that there is no substantial difference in the range of SCAT scores between the sexes although there does appear to be an increasing heterogeneity at higher grades. (See Table 16.) From this there is no evidence to suggest that the SCAT test discriminated against females.

In general, the goal of attracting girls to the MTYMP was met with limited success.

Readiness for Studying Algebra

The question was raised of pupil readiness for studying algebra since many of the participants would skip one or two years of junior high school mathematics and therefore might lack certain essential knowledge or skills. Thus, the Advisory Committee directed that all pupils be given a diagnostic test of algebra readiness at the first class meeting. The selection of a diagnostic tool was left to the MTYMP teachers.

The test chosen for a diagnostic pretest was the Minneapolis Public Schools Minimum Essentials Test--Elementary Algebra, Semester I. This test is administered to Minneapolis pupils as a criterion test for receiving credit in algebra. A score of 36 out of 45 is the criterion for a "Pass". Figure 3 shows the scores earned by the MTYMP pupils on the first night of class. It will be noted that in the MTYMP-TC classes, even before instruction began, one-third of the seventh and eighth graders and all but three of the ninth graders scored high enough to have qualified for one semester of credit in algebra according to Minneapolis Public Schools criteria. The ninth graders were, for the most part, enrolled in algebra in their home schools since September (approximately 7 weeks), but the seventh and eighth graders generally were not.

Table 15
SCAT-Q Scores of Potential Seventh and Eighth Grade Participants

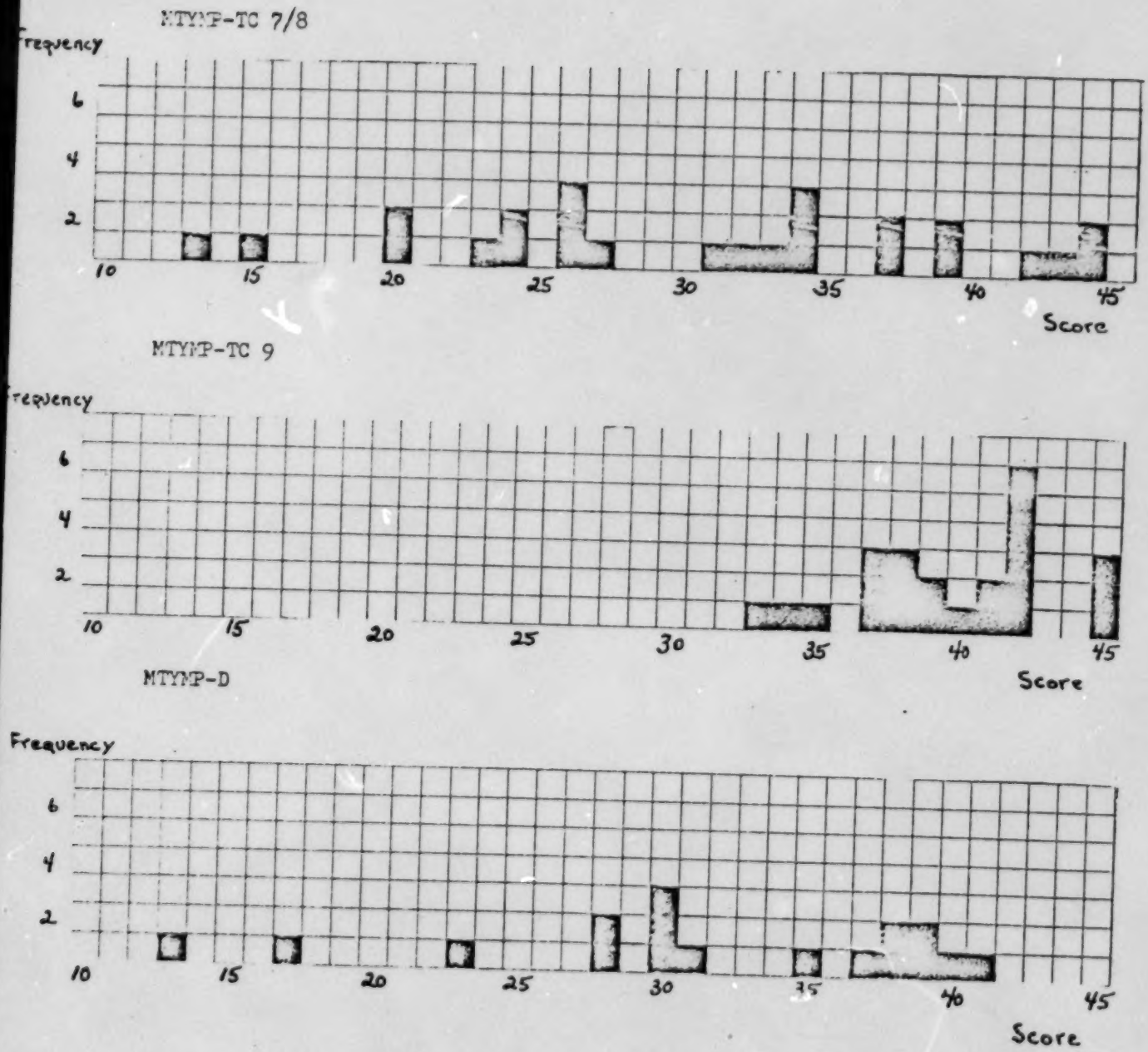
SCAT-Q Score	Grade Seven		Grade Eight		Total
	Girls	Boys	Girls	Boys	
45	0	1	1	4	6
45	0	0	3	5	8
44	0	3	4	15	22
43	1	2	7	8	18
					54

Table 16
Means and Standard Deviations of SCAT Scores by Sex and Grade

		Boys		Girls		All Ss	
	Grade	Mean	S.D.	Mean	S.D.	Mean	S.D.
SCAT-Q	7/8	456	18	456	16	456	17
	8/9	462	18	462	18	462	18
	9/10	469	18	467	17	468	18
	10/11	474	18	469	17	471	18
	11/12	477	18	471	17	474	18
	12	479	18	473	17	476	18
	13	481	18	477	18	479	18
	14	487	18	480	17	484	17
SCAT-V	7/8	443	16	445	16	444	16
	8/9	449	16	450	16	449	16
	9/10	453	17	455	16	454	16
	10/11	458	17	458	16	458	16
	11/12	462	17	462	17	462	17
	12	465	16	465	16	465	16
	13	470	17	472	17	471	17
	14	476	15	476	17	476	16
SCAT - Total	7/8	450	14	451	13	451	13
	8/9	455	14	456	14	456	14
	9/10	460	15	460	15	460	15
	10/11	465	15	463	15	464	15
	11/12	469	16	466	15	467	16
	12	471	15	468	15	469	15
	13	475	16	473	16	474	16
	14	480	14	477	15	479	14

Figure 3

Diagnostic Test -- Algebra, Semester I



The MTYMP teachers conducted an item analysis for their respective classes and used that information to guide their instruction on specific topics which the diagnostic test indicated to be areas of weakness for the pupils. On December 16, the MTYMP-TC 9 class took a parallel form of the Minneapolis Semester I test. Their scores are shown in Figure 4. All surpassed the criterion score and more than half earned scores of 44 or 45. Twelve class periods later, on March 24, both MTYMP-TC groups took the Semester II test. Those results are shown in Figure 5.

There appeared to be no problems caused by a lack of readiness for learning algebra. The diagnostic assessment allowed the teachers to address any specific topics not adequately developed. The later tests provided formative data to guide subsequent instruction. Additional learning outcomes will be discussed in the section which follows.

Algebra Achievement

Instruction in the MTYMP integrated the topics usually treated in Algebra I and Algebra II. Figure 6 lists the curriculum topics covered throughout the year. The COOP tests were selected as appropriate measures of the students' comprehension of basic concepts, techniques and unifying principles. The content areas measured by these tests, as reported in the COOP Handbook (Educational Testing Service, 1964), are listed in Figures 7 and 8. Data on the validity and reliability of the COOP tests, complete norms, and classification of test items by content areas are all reported in the COOP Handbook and will not be repeated here.

Three forms of the COOP test were administered during the program. The State Department of Education consultant expressly requested that the students be pre- and post-tested on knowledge of algebra. However, a pre-test of Algebra I was deemed inappropriate for these pupils because of their advanced learning of mathematics. Their performance on the Minneapolis tests reported earlier confirms this position. However, it was decided that pre-test of Algebra II could be administered early in the program. In the MTYMP-TC classes, the test schedule was as follows:

January 13, 1977	COOP Algebra II, Form A (Pre-test)
April 5, 1977	COOP Algebra I, Form A (Criterion)
June 2, 1977	COOP Algebra II, Form B (Criterion)

The MTYMP-D schedule was:

March 17, 1977	COOP Algebra II, Form A (Pre-test)
May 5, 1977	COOP Algebra I, Form A (Criterion)
June 2, 1977	COOP Algebra II, Form B (Criterion)

The results of the various achievement measures will be reported separately.

Algebra I Achievement

The COOP-I test contains 40 items and the maximum raw score is 40. Scores of pupils in the three classes are presented in Figure 9. National norms for grades eight and nine are given in Table 17. Also reported are the means and standard deviations of the SCAT-Q scores for the norm group. A raw score of 30 was required for Algebra I credit, and all pupils attained scores above this cutoff. All but two scored at the 95 percentile or above, and three-fourths of the entire group ranked at the 99 percentile.

Figure 4

Minimum Essentials Test -- Algebra, Semester I
MTYMP-TC 9 Test Results

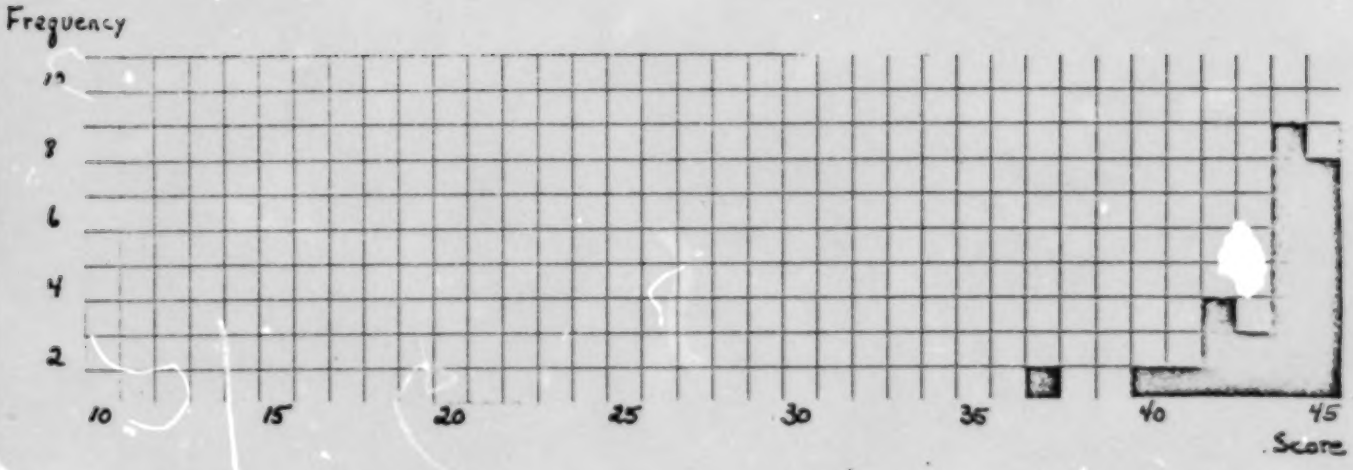
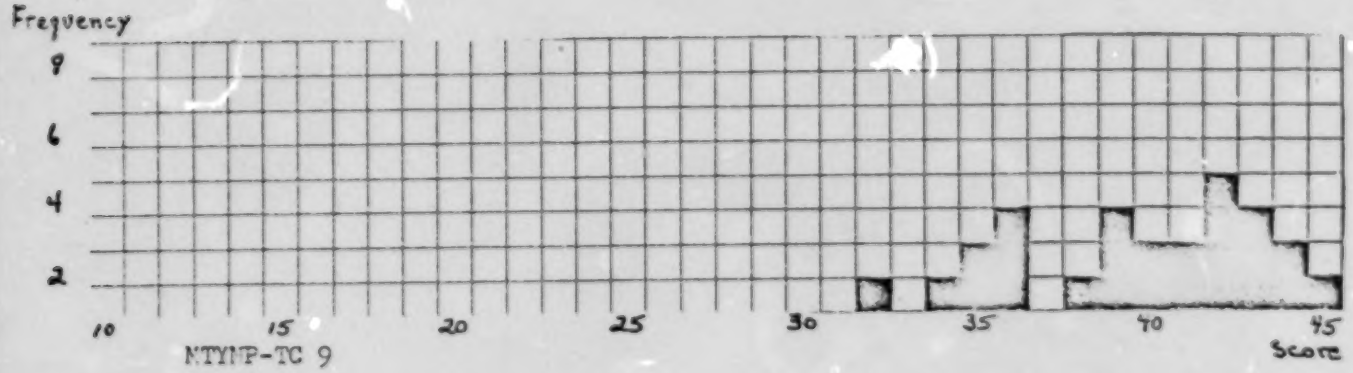


Figure 5

Minimum Essentials Test -- Algebra, Semester II
MTYMP-TC Test Results

MTYMP-TC 7/8



MTYMP-TC 9

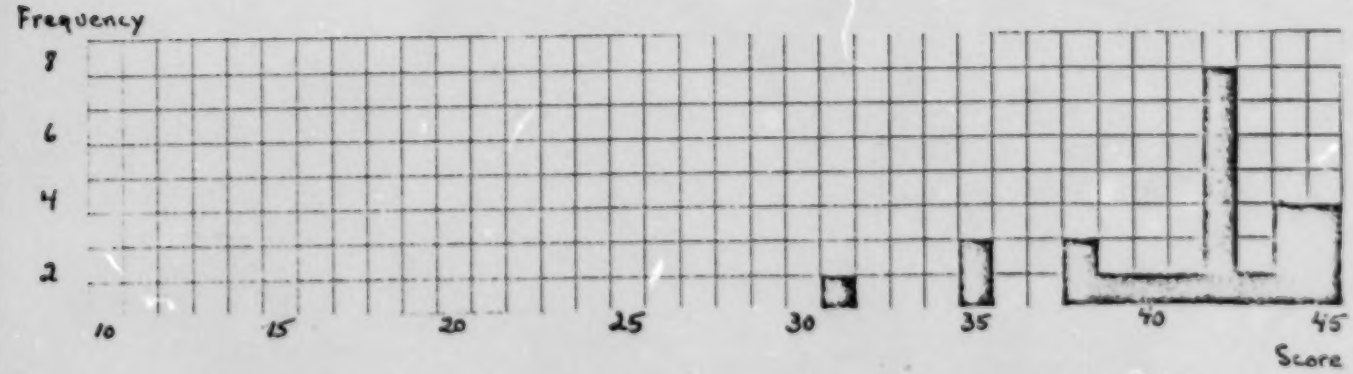


Figure 6

MINNESOTA TALENTED YOUTH MATHEMATICS PROJECT (MTYMP)

CURRICULUM TOPICS - Oct. 1976 - June, 1977

1st 10 Weeks

1. Simplifying algebraic expressions
2. Solving linear equations with one variable
3. Solving linear inequalities with one variable
4. Simplifying polynomial expressions
5. Multiplying binomials
6. Factoring polynomials
7. Solving quadration equations without use of quadratic formula
8. Graphing lines from equations, two points, and slope-intercept methods
9. Finding equations from graphs, two points, and slope-intercept methods

2nd 10 Weeks

10. Solving absolute value relationships with one or two variables
11. Solving two equations in two variables by substitution, addition, and graphing
12. Solving three equations in three variables by substitution and matrices
13. Solving two equations in three variables
14. Solving systems of linear inequalities by graphing and finding the extreme points.
15. The Pythagorean Theorem
16. Operations involving squares, radicals, square roots and simplifying
17. Solving equations by factoring, completing the square and the quadratic formula
18. Graphing and transforming quadratic functions of the form $f(x)=a(x - h)^2+k$
19. Using the distance formula
20. Solving and graphing equations of conic sections
21. Operations with complex numbers
22. Solving ratio, proportion, and rational expression problems
23. Scientific notation, exponential and logarithmic functions

Last 9 Weeks

24. Operations with rational fractions
25. Properties of 30-60 right triangle
26. Related angles
27. Areas of general triangles
28. Properties and graphs of trigonometric functions
29. Trigonometric equations and identities
30. Radian measure and arc length
31. Half-angle, double angle formula
32. Law of Cosines and Law of Sines
33. Arithmetic and Geometric sequences
34. Sums of arithmetic series
35. Halving and doubling at times of sequence

Figure 7

Content Areas: COOP Algebra I

Combining terms
Translation from verbal to algebraic expressions
Solution of linear equations
Substitution in algebraic expressions and equations
Solution of literal equations
Exponents and roots
Algebraic multiplication and division
Averages
Systems of linear equations
Graphs of linear functions
Linear equations and order
Factoring quadratic equations
Division by zero
Variation

Figure 8

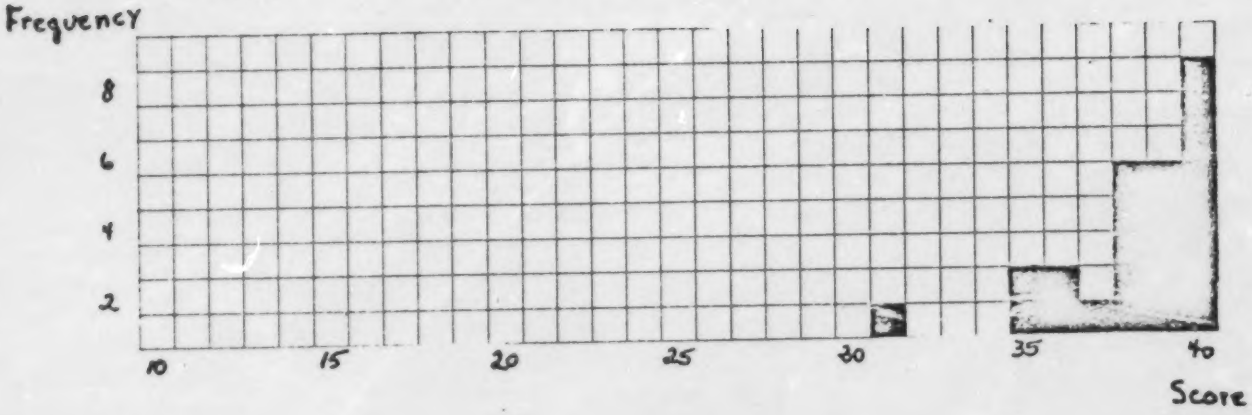
Content Areas: COOP Algebra II

Operations with algebraic expressions
Roots and powers of numbers
Solutions of linear equations and inequalities
Solutions of quadratic equations and inequalities
Solutions of systems of equations and inequalities
Solutions of word problems
Properties of linear functions
Properties of quadratic functions
Factoring
Progressions
Logarithms
Exponential equations and equations involving radicals
Complex numbers
Evaluation of a function
Absolute value

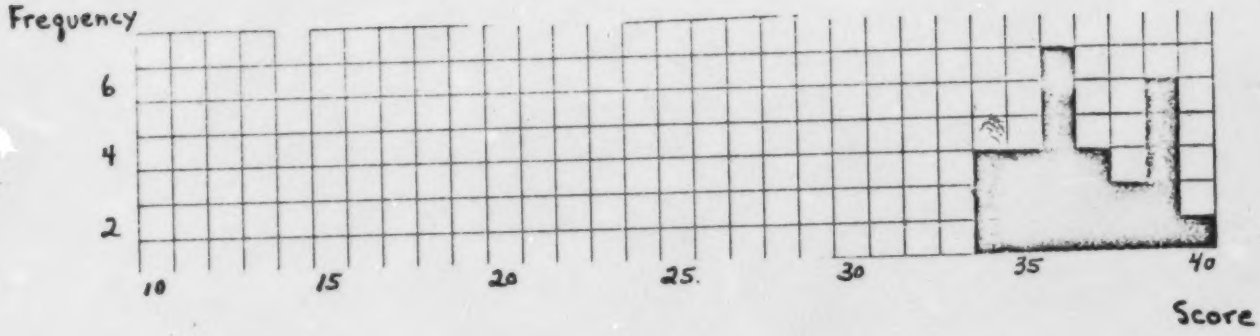
Figure 9

Algebra I Criterion Test Results

NTYMP-TC 7/8



NTYMP-TC 9



NTYMP-D

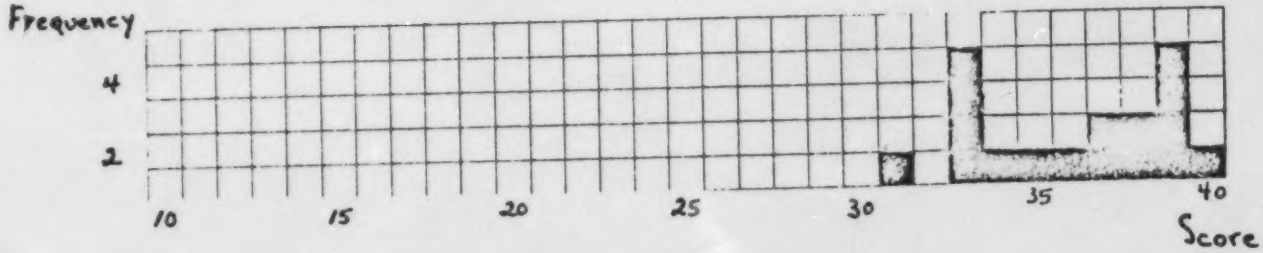


Table 17
National Norms: COOP Algebra I, Form A

Score		Eighth Grade Norms		Ninth Grade Norms	
Raw	Converted	Percentile Band	Mid-	Percentile Band	Mid-
40	176				
39	174	99-99.9	99.8		
38	173	97-99.9	99.4	97-99.9	99.6
37	172	97-99.9	99.4	97-99.9	99.6
36	170	95-99.8	99	96-99.9	99.2
35	169	90-99.4	97	93-99.6	97
34	167	87-99	95	89-99.2	96
33	166	87-99	95	89-99.2	96
32	165	83-97	90	87-97	93
31	163	73-95	87	79-96	89
30	162	73-95	87	79-96	89
Mean		152		150	
Standard Deviation		9		10	
75 percentile		159		157	
50 percentile		153		150	
25 percentile		146		144	
SCAT-Q Mean		306		301	
SCAT-Q S.D.		13		15	

Table 18 shows the number of items in the COOP-I test answered correctly by all, all but one, etc., pupils in each class. Of the 120 items categorized in Table 18 (40 test items for each class), only eleven were answered correctly by fewer than 80 percent of the pupils in the class. An examination of those items further showed that in nine of the eleven cases the other test items measuring the same content were missed by no more than two students. These results indicate not only the superior performance of the individual pupils, but they also suggest that the content of Algebra I was well covered even though presented in the integrated manner.

Algebra II Achievement

The COOP-II also is a 40-item test with a maximum raw score of 40. Scores on the two test forms can be compared if they are transformed into converted scores. Table 19 shows raw and converted scores and national norms for the upper quartile of the distribution on both forms of COOP-II. Figures 10 and 11 give the pre-test and post-test scores of the three classes.

Once again, a raw score of 30 was required to meet the 88 percentile criterion. Six students scored below this level. As decided by the Advisory Committee, they were allowed to take a retest at a later date, and all were re-tested with Form A of COOP-II. All six attained the required 30 or above on the second test and accordingly they were granted credit in Algebra II. However, all analyses reported here use the scores on the original criterion test only.

Only two MTYMP-TC students did not complete Algebra II by June. One seventh grade boy chose to drop from the program after earning credit in Algebra I. An eighth grade boy broke his arm in the spring and could not take the final test. He was expected to complete MTYMP Algebra II requirements during the summer, but he did receive Algebra I credit by June.

Table 20 shows the number of items on the COOP-II criterion test answered correctly by all, all but one, etc., pupils. For the three classes, the two most frequently missed items were the same suggesting that they may have referred to topics not stressed in class. Only 20 other items of the 120 items tabulated were answered correctly by fewer than 80 percent of the class, and an examination of these 20 items showed that each represented one test item in a content area for which the rest of the test items were answered by at least 80 percent of the pupils. Hence, not only did the MTYMP students show superior performance on the Algebra II examination, but also the content of Algebra II was well covered in the integrated curriculum.

The administration of the pre-test and post-test of Algebra II enables comparisons to be made of student performance on the two examinations. This was done using the t-test for two related samples and a one-tail test of significance. The results of that analysis are summarized in Table 21. The gains were significant at the .005 level and beyond for both girls and boys in all three classes. Although the MTYMP students entered the program knowing a considerable amount of algebra, they significantly increased that knowledge during the year.

Table 18
Number of Items Answered Correctly by
N, N-1, etc., Students
COOP-I

Number of Students Answering Item Correctly	Number of Items		
	MTYMP-TC 7/8	MTYMP-TC 9	MTYMP-D
24	18		
23	11	17	
22	5	9	
21	2	1	
20	3	3	
19		2	
18	1	2	
17		4	9
16			15
15		2	7
14			5
13			1
12			1
11			1
10			1

Table 19
National Norms: COOP Algebra II

Raw Score		Converted	National Norms	
Form A	Form B	Score	Percentile Band	Mid-
40	40	177		
		176		
39	39	175	98-99.9	99.7
38	38	174	98-99.9	99.7
	37	173	97-99.9	99.2
37		172	97-99.9	99.2
36	36	171	95-99.7	98
35	35	170	95-99.7	98
	34	169	93-99.2	97
34		168	93-99.2	97
33	33	167	88-98	95
32	32	166	88-98	95
	31	165	85-97	93
31		164	85-97	93
30	30	163	79-95	88
	29	162	79-95	88
29	28	161	75-93	85
28		160	75-93	85
27	27	159	67-88	79
	26	158	67-88	79
26	25	157	59-85	75

Mean	150
Standard Deviation	10
75 percentile	157
50 percentile	150
25 percentile	143
SCAT-Q Mean	309
SCAT-Q S.D.	15

Figure 10

Algebra II Pretest Results

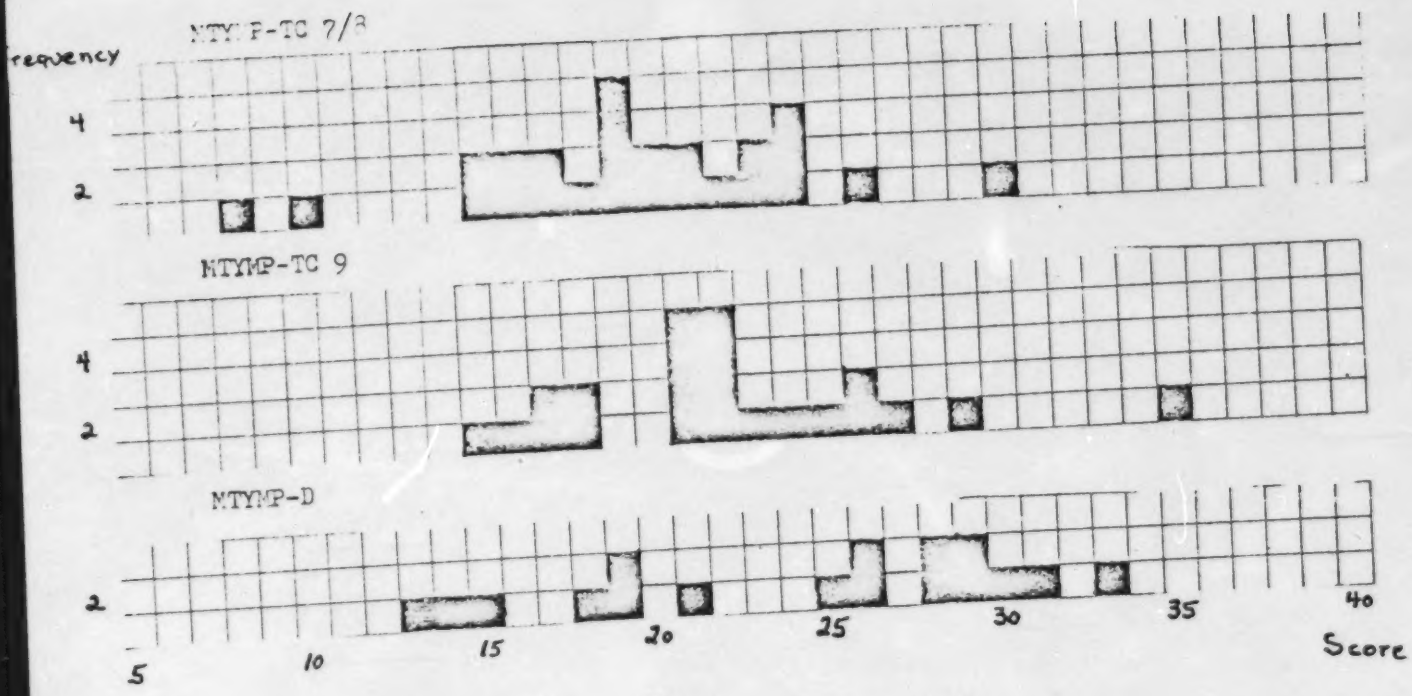


Figure 11

Algebra II Criterion Test Results

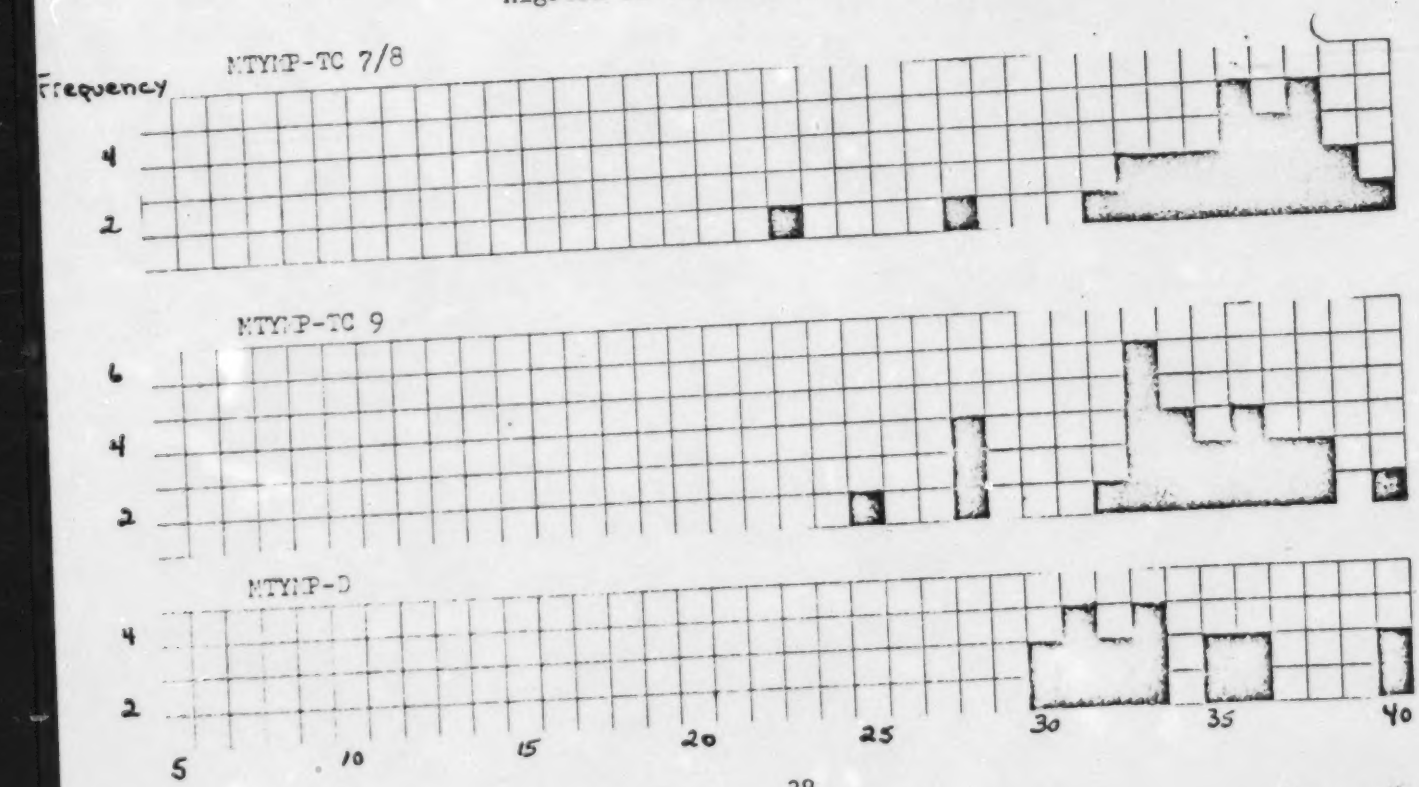


Table 20
Number of Items Answered Correctly by
N, N-1, etc., Students
COOP-II

Number of Students Answering Item Correctly	Number of Items		
	MTYMP-TC 7/8	MTYMP-TC 9	MTYMP-D
23	7	5	
22	8	10	
21	9	8	
20	3	3	
19	7	2	
18	2	1	
17	2	2	
16		2	7
15		4	12
14		1	7
13	1		3
12			4
11	1		1
10		1	2
9			2
8		1	1
.			
.			
.			
4			1

Table 21
Algebra II Achievement of MTYMP Students

	MTYMP-TC 7/8			MTYMP-TC 9			MTYMP-D
	Girls	Boys	All	Girls	Boys	All	All
Pre-test Mean	149.7	148.3	148.7	152.3	152.7	152.6	155.1
Post-test Mean	170.8	170.4	170.5	167.0	169.3	168.7	168.1
Mean Gain	21.1	22.1	21.8	14.7	16.6	16.1	13.0
N	6	18	24	6	16	22	16
t	16.88	14.64	18.79	6.77	11.61	13.64	8.28
degrees of freedom	5	17	23	5	15	21	15
Significance (one tail test)	$p < .0005$	$p < .0005$	$p < .0005$	$p < .005$	$p < .0005$	$p < .0005$	$p < .0005$

All scores are converted scores. MTYMP-TC pre-test given on January 13; MTYMP-D pre-test on March 17. All post-tests given June 2.

Course Grades and Credits

In addition to the achievement measures from the COOP tests, pupils were graded on their homework, weekly tests, and class participation. Written progress reports (see Appendix C) were mailed to parents at the end of each ten weeks. Table 22 reflects pupil progress as measured by teacher grades. By June 3, 65 students received credit in Algebra I; 63 also received credit in Algebra II. Only one Algebra II grade was below a "B".

Affective Characteristics of MTYMP Pupils

The achievement results reported above give evidence that the MTYMP achieved its first objective of increasing the participant's knowledge of algebra. The second concern of the project stressed the importance of maintaining and enhancing positive attitudes toward mathematics and toward self. The literature on the effect of attitudes on achievement reports mixed results, but it is generally accepted that there is at least a low to moderate positive correlation between the two. In addition, pupils' self-concepts of their own ability to learn mathematics have been shown to bear similar positive relationships to academic achievement. And both attitudes toward mathematics and toward self likely influence an individual's choice to approach or to avoid the study of mathematics in the future. These concerns appear to be especially valid in the case of females.

To obtain information on relevant affective characteristics of the MTYMP pupils, attitudes were measured using the Mathematics Attitude Inventory (MAI) (Sandman, 1973). The MAI contains statements with which the student expresses a degree of agreement or disagreement, and it yields scores on six dimensions of attitude:

Perception of the mathematics teacher: A measure of the students' view of the mathematics teacher with respect to a variety of personal characteristics.

Anxiety toward mathematics: A measure of the level of anxiety which the student feels in the presence of mathematics.

Value of mathematics in society: A measure of the student's view of the usefulness of mathematical knowledge.

Self-concept: Specifically, self-concept of ability in mathematics, a measure of the student's view of his or her own competence in the subject.

Enjoyment of mathematics: A measure of the pleasure the student derives from engaging in mathematical activity but not necessarily as compared to any other activity.

Motivation in mathematics: A measure of the student's desire to increase his or her mathematical knowledge--specifically, the desire to do work in mathematics beyond the regular class requirements.

Table 22
Grades Earned by MTYMP Pupils

Class	Grade	First Trimester	Second Trimester	Final Grade Algebra I	Final Grade Algebra II
MTYMP-TC 7/8	A	21	11	24	14
	A-	3	7		2
	B+	1	2		3
	B		3	1	1
	B-				2
	C+		1		1
	C		1		
MTYMP-TC 9	A+	1	2	1	1
	A	18	14	22	14
	A-		2		2
	B+	2	4		3
	B		1		3
	B-				
	C+				
	C	2			
MTYMP-D	A			17	15
	B				2

Sandman (1973, p. 64) reported the results of a factor analysis of the items in the MAI. These results indicated that the six attitude scales appear to measure six empirically distinct constructs, and they gave evidence of the internal validity of the instrument. The reliabilities of the six scales using Cronbach's alpha coefficient were reported to be .83, .86, .77, .83, .85 and .76, respectively (Sandman, p. 54).

The MAI was administered to the MTYMP pupils in November to obtain information on the attitudes with which they entered the program. It was administered again in May as a means of detecting changes in attitude which may have occurred. In an attempt to determine similar attitude characteristics of pupils not in the MTYMP, three mathematics classes were selected in a Twin Cities junior high school not represented in the MTYMP. The three classes were designated by the school principal as "enriched" and each enrolled high ability pupils. One class was at each junior high grade level: seventh (7E), eighth (8E), and ninth (9E). Students in these classes also responded to the MAI in November and in May.

It is important to stress that the attitude assessment was intended to produce descriptive profiles of the affective characteristics of students in the various classes. No attempt should be made to statistically compare classes on these scales since the populations and the learning experiences were different. However, the junior high school enriched classes may be viewed as representative of the mathematics classes in which the MTYMP pupils would likely be enrolled were they not in the MTYMP, and as such they present certain baseline information from which to draw descriptive comparisons.

Each statement in the MAI calls for the student to strongly agree, agree, disagree, or strongly disagree. These responses are weighted from 1 to 4 in such a way that a positive attitude receives a 4. Scores on each of the six scales are the mean scores for the eight items in that scale. Hence, the range of possible scores is from 1 to 4 for each scale. A high score indicates a favorable or positive attitude on each scale except anxiety. For that scale, a high score suggests a high level of anxiety which is viewed as a negative or unfavorable characteristic.

Class means were calculated for each of the six scales on the fall and spring administrations of the MAI. These class means and changes in class means are shown in Table 23. Differences were calculated as spring mean score minus fall mean score. Hence, a positive value of the difference corresponded to an increase on that dimension of attitude and would be seen as a desirable outcome in every case except anxiety. There a negative value for the difference would be representative of a decrease in anxiety, a favorable outcome.

Many of the changes in mean scores recorded in Table 23 were small and did not suggest marked differences between the MTYMP classes and the junior high school classes. Those measures on which there did appear to be differences were in the self-concept, motivation and value scales and, for ninth graders, in anxiety.

Table 23
Mathematics Attitude Inventory
Class Means

MAI Scales		MTYMP Classes			Junior High School Classes		
		MTYMP-TC 7/8	MTYMP-TC 9	MTYMP-D	7E	8E	9E
Perception of of Math Teacher:	Fall Mean	3.47	2.99	2.64	3.55	3.16	3.26
	Spring Mean	3.43	3.07	3.59	3.63	2.98	3.16
	Difference	-0.04	0.08	0.95	0.08	-0.18	0
Anxiety toward Mathematics:	Fall Mean	1.43	1.51	1.65	1.57	1.74	1.80
	Spring Mean	1.55	1.67	1.62	1.70	1.78	1.79
	Difference	0.12	0.16	-0.03	0.13	0.04	-0.01
Value of Mathematics:	Fall Mean	3.53	3.48	3.46	3.40	3.51	3.31
	Spring Mean	3.70	3.42	3.59	3.47	3.48	3.43
	Difference	0.17	-0.06	0.13	0.07	-0.03	0.12
Self-Concept:	Fall Mean	3.47	3.49	3.45	3.25	3.32	2.98
	Spring Mean	3.23	3.18	3.25	3.06	3.19	3.06
	Difference	-0.24	-0.31	-0.20	-0.19	-0.13	0.08
Enjoyment of Mathematics:	Fall Mean	3.33	3.17	3.11	3.06	3.07	2.95
	Spring Mean	3.24	3.13	3.27	3.09	2.93	2.89
	Difference	-0.09	-0.04	0.16	0.03	-0.14	-0.06
Motivation in Mathematics:	Fall Mean	3.26	3.03	3.03	2.80	2.89	2.83
	Spring Mean	3.02	2.84	3.22	2.88	2.82	2.81
	Difference	-0.24	-0.19	0.19	0.08	-0.07	-0.02

For the two MTYMP-TC classes it was possible to test the significance of these changes using the t-test for related samples. These results are recorded in Table 24. Only students who completed both fall and spring administrations of the MAI could be included in this test. Therefore, it was necessary to eliminate five students from the sample which accounts for several slight differences in change of class mean occurring between Tables 23 and 24. No such tests were made for the MTYMP-D or junior high school classes because individuals in those classes were not identifiable.

The significant changes common to both MTYMP-TC classes were the decreases in self-concept and in motivation. For the MTYMP-TC 7/8 pupils, their perception of the value of mathematics increased significantly; ninth graders showed a significant increase in anxiety. These results suggested several questions, discussed below, which the project directors might investigate further.

First, the change in self-concept should be viewed with caution until more studies can be done. An individual's perception of his or her own competence in mathematics is formed in relation to his or her perception of the relative competence which others demonstrate. In the MTYMP classes, highly competent mathematics students were brought together with equally talented peers, and this may be a major factor in the pupils' reassessment of their own ability. It is an interesting question which warrants more careful investigation. A related question is whether the self-concepts of pupils who elect to continue in the second year of the MTYMP continue to show declines or whether they stabilize or even increase.

The change in motivation should be viewed in the light of the very specific dimension of that characteristic which the MAI measures, namely, the desire to work in mathematics beyond the regular class requirements. The demands placed upon the MTYMP pupils were significant and they were required to do a great amount of mathematics on their own during the week. Also, they were challenged with content at a much more advanced level than they had previously experienced. In the light of these two changes in their experience of the demands of the course, they may have been less likely to express strong desire to go beyond class requirements. It would be useful to investigate further the specific components of the change in motivation which these pupils experienced.

During the year several mathematics educators were invited to make presentations to the MTYMP pupils on various topics of mathematics and its applications. These were scheduled after the MTYMP classes and attendance was optional, so no attempt was made to access pupil response to the presentations. It is possible, however, that they contributed to enhancing the pupils' perception of the value of mathematics. More information should be collected on pupil response to these enrichment sessions and on their contribution to the pupils' perception of the value of mathematics. Such data would help future program planners to develop and extend this aspect of the learning experience.

The significant rise in anxiety among ninth graders probably is related to their decrease in self-concept. It also may be influenced by their pending transfer to senior high schools and the possibility that the MTYMP class was a foretaste of senior high and college mathematics. Before any conclusions can be drawn, it will be necessary to obtain more precise information on the roots of their anxiety. The concern is an important

Table 24
Attitude Changes of MTYMP-TC Pupils

MAI Scale	MTYMP-TC 7/8			MTYMP-TC 9		
	Girls N=5	Boys N=17	All N=22	Girls N=6	Boys N=15	All N=21
Teacher						
Change	-0.10	<0.01	-0.02	0.08	0.07	0.08
t						
Significance	none	none	none	none	none	none
Anxiety						
Change	0.05	0.08	0.08	0.19	0.14	0.15
t				2.26		1.83
Significance	none	none	none	p <.10	none	p <.10
Value						
Change	0.27	0.17	0.20	0.11	-0.11	-0.05
t		2.07	2.50			
Significance	none	p <.10	p <.05	none	none	none
Self-Concept						
Change	-0.15	-0.21	-0.19	-0.44	-0.29	-0.33
t		-1.78	-1.98	-5.73	-3.13	-4.71
Significance	none	p <.10	p <.10	p <.01	p <.01	p <.001
Enjoyment						
Change	-0.13	-0.07	-0.09	-0.19	-0.01	-0.06
t			-1.55	-1.80		
Significance	none	none	p <.20	p <.20	none	none
Motivation						
Change	-0.25	-0.25	-0.25	-0.19	-0.19	-0.19
t		-2.5	-3.13		-2.57	-2.16
Significance	none	p <.05	p <.01	none	p <.05	p <.05

All tests of significance are two-tailed tests. Only significant t-values are recorded.

one, however, since mathematics courses become electives in the senior high school and students with high anxiety levels are likely to avoid mathematics when given the option.

Finally, one must be cautious in viewing the results for girls which are recorded in Table 24. The number of girls in each class was extremely small thus making it difficult to detect significances in their change in attitude. In general, the question of the affective changes experienced by girls in the program remains unanswered.

The MTYMP Committee's concern over the affective outcomes of the program resulted in the measurement of six dimensions of mathematics attitude and in the detection of several significant changes in these characteristics. These suggest areas of further investigation which could lead to enhanced learning experiences for gifted mathematics students.

Learning Environment in the MTYMP

The MTYMP directors were interested in determining how the pupils viewed their learning experience in the fast paced classes. This information could be used to help provide positive, supportive learning environments in the future. They also desired information on the learning experiences of the MTYMP pupils when in their home schools in order to facilitate the development of appropriate options which home schools could provide.

To help address the first question of how pupils viewed the fast paced classes, both MTYMP-TC groups responded at the end of the course to the Learning Environment Inventory (LEI) (Anderson, 1971). The LEI consists of 105 statements about the classroom climate with which the pupil strongly agrees, agrees, disagrees, or strongly disagrees. It is scored in a manner similar to the scoring of the MAI described earlier. The LEI yields scores on 15 dimensions of the classroom environment, and class means on these 15 scales can be viewed as an estimate of classroom climate. Three of the scales, cohesiveness, friction and competitiveness, measure interpersonal relationships between pupils. Pupil-teacher relationships are assessed in four scales: formality, democracy, disorganization and favoritism. The speed, difficulty, diversity and satisfaction measures refer to relationships between the pupils and both the subject studied and the method of learning. Finally, the pupils' perception of the structural characteristics of the class are assessed in the goal direction, environment, cliqueness and apathy scales. Each of these scales is described briefly below:

Cohesiveness: a feeling of intimacy which may develop when individuals interact for a period of time and which serves to separate group members from nonmembers.

Friction: the degree of disagreement, tension, and antagonism in the class.

Competitiveness: the extent to which class members vie with each other.

Formality: the degree to which the behavior of class members is governed by formal rules.

Democracy: the degree of student participation in class decision making.

Disorganization: the extent to which the class is lacking in organization.

Favoritism: the extent, to which certain students enjoy more privileges than others.

Speed: the rate of progress of the class.

Difficulty: the extent to which the pupils are challenged by the subject matter.

Diversity: the extent to which the class provides for a variety of pupil interests and activities.

Satisfaction: the degree of pupil liking for the class.

Goal direction: the degree of group recognition and subsequent acceptance of goals.

Environment: an assessment of the physical environment, including space and available facilities.

Cliqueness: the existence of subgroups within a class.

Apathy: the extent to which class members feel no affinity with class activities.

Anderson presented an extensive discussion of the validity of the LEI scales which will not be repeated here. He also reported alpha coefficients of internal consistency ranging from .54 to .86 for the 15 scales with most of these values lying between .65 and .86. Complete reliability and validity data are available in Anderson (1971).

Shown in Table 25 are the class means on the LEI for the two MTYMP-TC classes and for two of the junior high school enriched mathematics classes which also responded to the MAI. Measurement of the learning environment in all four classes took place at the end of the school year. As with the MAI, the class means are descriptive only and no attempt should be made to draw statistical comparisons.

Scores on the LEI range from 1 to 4 with 4 indicating a high degree of the variable in question. As an approximation of classroom climate, scores of 2.9 and above were taken to indicate a high degree of agreement that the given characteristic describes the class; a score of 2.1 or below indicated disagreement with the given characteristic as descriptive of the class. These are indicated as plus (agreement) and minus (disagreement) in Table 25. Thus, MTYMP pupils viewed their classes as fast paced, difficult and goal directed. The disagreement on the apathy scale indicated that pupils did feel an affinity or identity with class activities. Other responses suggest that the

Table 25
Learning Environment Characteristics
Class Means

Environment Scale (LEI)	MTYMP Classes		Junior High School Classes	
	MTYMP-TC 7/8	MTYMP-TC 9	7E	9E
Cohesiveness	2.65	2.54	3.14 +	2.78
Friction	2.28	2.40	2.01 -	2.12
Competitiveness	2.60	2.56	2.33	2.41
Formality	2.45	2.05 -	2.62	2.54
Democracy	2.67	2.75	2.44	2.57
Disorganization	1.78 -	2.25	2.12	2.10 -
Favoritism	1.78 -	1.95 -	2.00 -	1.91 -
Speed	2.99 +	3.08 +	2.31	2.54
Difficulty	2.91 +	3.19 +	2.47	2.95 +
Diversity	2.84	3.01 +	2.91 +	2.[illegible] +
Satisfaction	2.92 +	2.67	3.00 +	2.53
Goal direction	3.22 +	2.91 +	2.99 +	2.84
Environment	2.55	2.55	2.77	2.82
Cliqueness	2.61	2.78	2.40	2.44
Apathy	1.89 -	2.08 -	1.99 -	2.27

+ indicates a high level of agreement with the characteristic (mean of 2.9 or above).
- indicates a high level of disagreement (mean of 2.1 or below).

classes provided for individual needs and interests (diversity), that the teachers did not communicate favoritism toward individual pupils, that the classes were organized, and that the pupils were satisfied with the class. Many of these same perceptions were true for pupils in the junior high school classes. Figure 12 further describes the perceptions which MTYMP pupils had of their classes. In the future, program directors may wish to investigate further the ways in which these environment characteristics contribute to pupil learning in the program and to the affective outcomes which they experience.

The second question pertaining to the learning environment of the MTYMP pupils concerned their mathematics experiences when in their own schools. The guidelines for the home schools (see Appendix B) suggested several alternatives which might be provided. The four principal options were the following:

1. Student remains in regular math class, is not required to do regular math, but time is used to do MTYMP home work. Math teacher provides necessary tutorial help.

2. Student does not attend regular math class, studies MTYMP math independently in specially designated study area during his/her regularly scheduled math period. Math teacher provides necessary tutorial help.

3. Student and teacher arrange special independent math project to be studied during regularly scheduled math class.

4. School provides student with option of taking computer math class or other math enrichment class(es) during regularly scheduled math class.

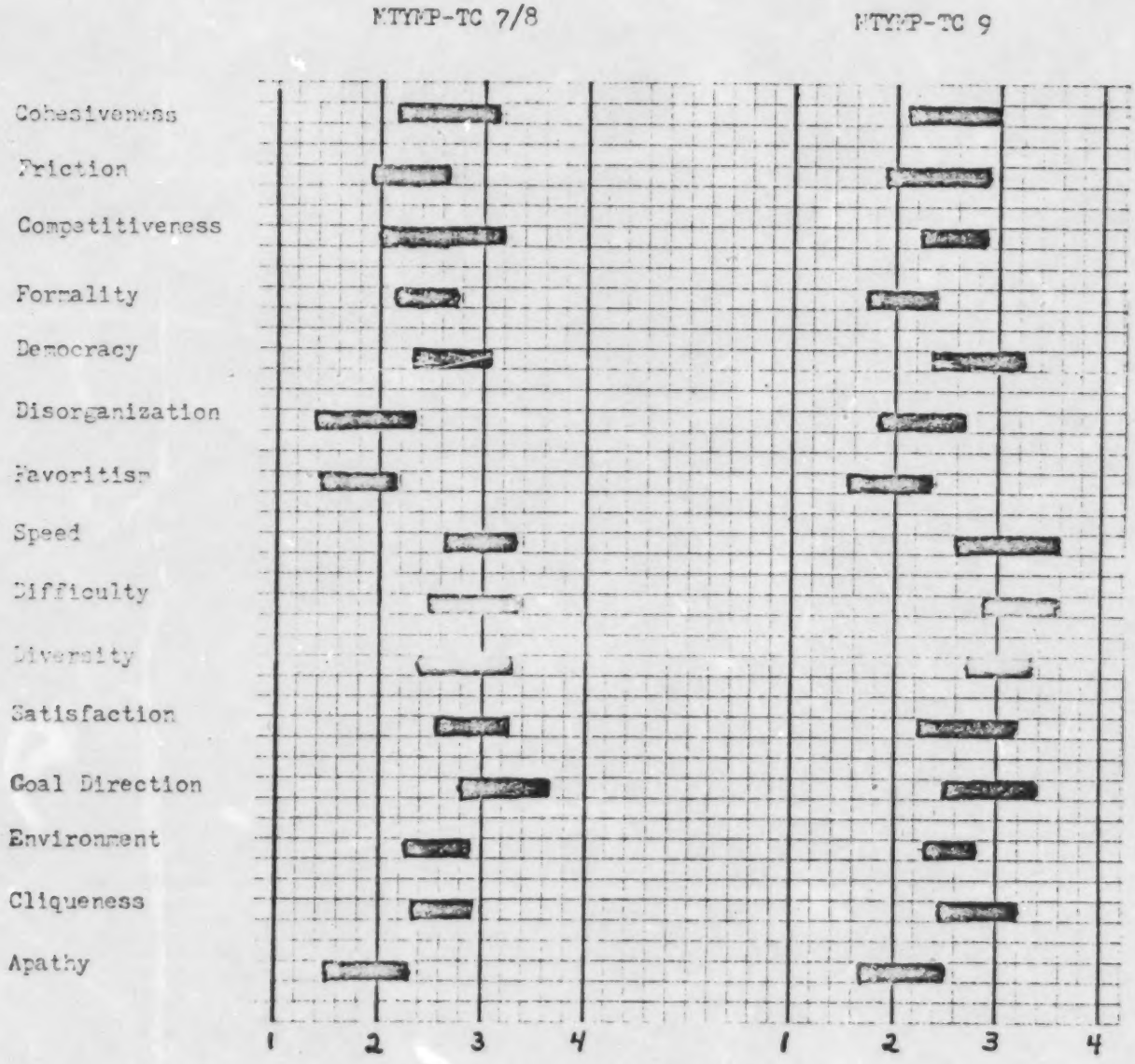
The home school mathematics teachers were polled in the spring (see Appendix C) to determine which of the alternatives operated for their students. Their responses are summarized below:

Option:	1	2	3	4
MTYMP-TC 7/8 pupils	11	18	1	5
MTYMP-TC 9 pupils	8	17	0	1

These responses were received for 24 seventh and eighth grade participants and 22 ninth graders. The totals above exceed these numbers because several teachers reported more than one alternative. It appears that home school teachers cooperated in providing the MTYMP pupils with study time and tutorial help.

Figure 12

Student Perceptions of the Learning Environment
in MTYMP-TC Classes



Bands represent class mean plus and minus one standard deviation.

Future Development of MTYMP Pupils

Of continuing concern to the project is the question of what future mathematics study the participants elect. One immediate indicator of this was the pupil's desire to continue in a second year of the program. It was the decision of the Advisory Committee that the second year of the MTYMP include classes for pupils continuing from the first year as well as at least one class for new students. The second year course will be Enriched Geometry and Trigonometry. The numbers of Twin Cities pupils preregistered for this course in June were as follows:

	Grade 7	Grade 8	Grade 9
Will return:	2 girls 3 boys	1 girl 7 boys	1 girl 7 boys
Undecided:	0	1 girl 1 boy	4 boys

All 17 Duluth pupils intended to re-enroll.

The reasons pupils gave for discontinuing at the end of the first year were varied. Most frequently they involved conflicts with other activities of the pupils such as athletics and music. For ninth graders who would be entering senior high school in the fall, the availability of advanced mathematics courses in the home school was also a factor. Students not returning to MTYMP would be expected tc take geometry in 1977-78 and twelfth grade precalculus mathematics the following year.

One indicator of the long term effectiveness of the MTYMP will be the future mathematical development of the pupils. Project directors should collect longitudinal data to follow-up on this question.

Conclusion and Recommendations

Sixty-five outstanding junior high school mathematics students received high school algebra credit in the MTYMP. Sixty-three of these completed two years of algebra in twenty-nine class sessions of two hours each. Classes met weekly outside of the regular school hours.

These pupils demonstrated significant achievement in algebra as measured by standardized tests of Algebra I and Algebra II, and the MTYMP achieved its objective of accelerating the mathematics learning of these very gifted pupils. Several changes in pupil attitude toward mathematics were noted. These deserve further study.

Funding has been granted for a second year of the MTYMP. The Year II program will offer a course in enriched geometry and trigonometry for MTYMP-TC pupils who wish to continue. Approximately half of the Twin Cities pupils and all the Duluth pupils are expected to return, and all three MTYMP teachers will be rehired. One new MTYMP class in Algebra I and II will be offered in the Twin Cities.

In planning for the Year II program, the project directors and Committee should direct their attention to the following concerns:

Earlier announcements and more widespread publicity of the talent search should draw participants from more schools than took part in the 1976 testing.

Continued concern for the identification of girls eligible for the MTYMP classes should be encouraged. Girls in the 1976-77 program showed no significant differences in achievement as compared to boys. The proportion of girls in the classes, however, was not representative of the proportion in the talent search.

The Committee decision to select participants primarily on the basis of their qualifying SCAT-Q score appears to be well grounded and should be maintained. There is evidence of a sufficient talent pool among seventh and eighth grade pupils to justify limiting the program to those grades if the Committee prefers to do so.

The attitudinal changes noted earlier warrant further study to determine both the specific nature of these characteristics and their relationship, if any, to achievement and to future study in mathematics. Also, follow-up studies of the MTYMP pupils through senior high school and college will provide additional information on the effectiveness of the project.

A systematic assessment of outside speakers and in-class attention to the applications of mathematics would aid in evaluating the effectiveness of this dimension of the program. The information gained will be valuable in making decision about the curriculum emphasis in these classes.

Several other aspects of the MTYMP experience have important implications for school districts and curriculum planners:

The pupils in the program have demonstrated high levels of mastery of two years of high school algebra, and many of the regular high school mathematics courses will be inappropriate for them. Continued efforts are needed to develop appropriate alternatives for them in their home schools. Also, schools should strive to make arrangements for the pupils to enroll in mathematics at nearby senior high schools or colleges.

The large number of qualified participants in the talent search indicates the existence of a significant pool of extremely capable junior high school pupils. Not only does this warrant expansion of the MTYMP, but it also suggests that local school districts should assign priority to identifying talented pupils within the system and to providing appropriate advanced learning experiences for them.

The MTYMP classes were structured to provide a unified treatment of Algebra I and Algebra II. More work is needed to identify and/or develop curriculum materials which facilitate this approach.

Finally, additional funding should be sought so that the MTYMP can be continued and expanded and so that local districts can be given assistance in developing their own programs. The first year of the MTYMP gave ample evidence of the existence of large numbers of talented Minnesota youth whose special needs can and should be met.

References

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Appendix A
MTYMP Advisory Committee

Twin Cities Advisory Committee

Louis Cohen, Mathematics Teacher, Bloomington Public Schools; President, Minnesota Council of Teachers of Mathematics.

David Dye, Coordinator of Mathematics Education, Minnesota State Department of Education.

Themeo Ellis, Principal, Carl Sandburg Junior High School, Robbinsdale.

William George, Associate Director, SMPY, Johns Hopkins University, Baltimore, MD.

Lorraine Hertz, Gifted Education Coordinator, Minnesota State Department of Education.

Peggy House, Assistant Professor, Mathematics Education, University of Minnesota.

Casey Withers Humphreys, Mathematics Resource Teacher, Minneapolis Public Schools.

Daniel Keating, Assistant Professor, Institute of Child Development, University of Minnesota.

Charles Lund, Mathematics Supervisor, St. Paul Public Schools.

Sally Sloan, Computer Resource Teacher, Minneapolis Public Schools.

Jan Wahl, Mathematics Curriculum Committee, Archdiocese of St. Paul-Minneapolis.

Steven Watson, Quest Program Director, St. Paul Public Schools; MTYMP Program Director.

Duluth Advisory Committee

Larrn Annett, Curriculum Director, Duluth Public Schools.

David Dye, Coordinator of Mathematics Education, Minnesota State Department of Education.

John Hanson, Superintendent of Schools, Esko, MN.

Lorraine Hertz, Gifted Education Coordinator, Minnesota State Department of Education.

Steven Watson, MTYMP Program Director.

James Zak, Mathematics Teacher, Cloquet Junior High School.

MTYMP Teachers

Lynn Durward, Duluth Public Schools

Eunice Kanning, Minneapolis Public Schools

Larry Luck, Minneapolis Public Schools

MTYMP Teaching Assistants

Claire Bishoff, Minneapolis

Barbara Ann Makitalo, Duluth

Steve Rosenberg, Minneapolis

Appendix B
MTYMP Guidelines

B-1: Policy Guidelines for Teachers of Fast-Paced Classes

B-2: Policy Guidelines for Suggested Testing Procedures

B-3: Policy Guidelines for the Home Schools of the Students

B-4: State Department of Education Special Requirements for Secondary Schools

B-5: Policy Guidelines for Parents and Students

MINNESOTA TALENTED YOUTH MATH PROJECT

POLICY GUIDELINES FOR TEACHERS OF FAST-PACED CLASSES

1. Teacher is responsible for:

   a. Teaching 30 two-hour class sessions.

      1) These class sessions should concentrate upon the instruction of the mathematics course material usually included in Algebra I and Algebra II. Guest speakers, tutorial work, take-home tests, and correcting of homework should be done outside of the regular class time.

2. Teacher is expected to teach to completion Algebra I and Algebra II. Trigonometry should be included if time permits.

3. Homework should be given, corrected, and returned regularly to properly monitor student achievement.

4. Guest speakers who might make presentations on the application of mathematics can be arranged to meet with the class before or after the class period or on some other day. This type of broadening experience is recommended.

5. The project will attempt to obtain qualified teaching assistants for those MTYMP teachers who request them. A small budget is provided for this purpose.

6. Teacher and students may design their own meeting schedule only if all students agree. They will have enough flexibility so that classes could be lengthened, doubled up, etc., in order to serve the needs of both students and teachers; for example, two three-hour classes instead of three two-hour classes for the occasional special situation.

7. The specific math curriculum (textbooks, etc.) should be determined cooperatively by the teachers and the advisory committee.

8. Teacher is expected to do all of the above and spend whatever time is necessary to complete the program at the stated salary of $50.00 per two-hour class session. The out-of-class time spent on planning, curriculum development, preparation, and student monitoring is expected to be performed without additional pay. A teaching assistant can be requested and the MTYMP has a small budget to cover the salary for such.

9. Teacher and the MTYMP will enter into a contractual agreement. If any of the above is not complied with, the teacher may be withdrawn from the program prior to completion.

MINNESOTA TALENTED YOUTH MATH PROJECT

POLICY GUIDELINES SUGGESTED TESTING PROCEDURES

1. Give standardized pre- and post-tests such as the Cooperative Mathematics Series to determine what to teach and whether or not to grant credit for completion of the course. The use of the diagnostic test is highly recommended because these students are far advanced over the students normally taught in standard Algebra I and Algebra II courses.

2. Set percentage minimums for successful performance in the courses. These should be in order for the school to grant credit.

3. Teacher-made tests should be given often to cover material taught in the class.

4. Take-home teacher-made tests are recommended to be used in conjunction with the ongoing, in-class tests.

5. Testing has to be done in order to identify student performance and achievement levels. Because of the extraordinarily high ability of the students, it is difficult for the teacher to know exactly what needs to be taught. TIES or MECC Comprehensive Achievement Monitoring (C.A.M.) tests may be used for prognosis and diagnosis of students' knowledge of subject matter to be taught. Frequent tests should eliminate the probability of a student participating all year and then not being able to achieve at the required achievement level for credit.

6. As much as possible, testing should occur outside the two hour class period.

MINNESOTA TALENTED YOUTH MATH PROJECT

POLICY GUIDELINES FOR THE HOME SCHOOLS OF THE STUDENT

1. School will accept the achievement of 88% on nationally standardized Algebra I and Algebra II tests such as Cooperative Mathematics Series and give students credit for each course he/she satisfactorily completes. Credit granted should be in mathematics.

2. Schools will provide one or more of the following options for the students in lieu of their regular math class: an opportunity to take a computer course; a study period when he/she can complete homework given in fast-paced class; time to work on independent study projects related to math, etc. A dinner meeting will be provided by the MTYMP for representatives (e.g., counselor or math teacher) from each student's junior high school wherein appropriate plans for each student will be made.

3. Schools must not require student who has satisfactorily completed Algebra I and II to take seventh grade mathematics, eighth grade mathematics, Algebra I, Algebra II, or other math classes which he/she has already shown is not appropriate for him/her.

4. Schools should have one or more of the following options available to students who satisfactorily complete the fast-paced mathematics sequence:

   a. Plane geometry in own or nearby junior or senior high school.
   b. Analysis/trigonometry in high school.

5. Junior and senior high schools should work together to give student's schedule flexibility in order for the student to take advanced math classes. It might be desirable to plan for possible taking of college math classes while student is in high school.

6. If no other way of continuous math classes can be found, it might be desirable to investigate independent study in math under the guidance of a senior high math teacher.

7. Fast-paced math classes implemented by the MTYMP have been approved by Edmund Lee, Director of Secondary Education; Dave Dye, Coordinator of Mathematics Education; and Lorraine Hertz, Gifted Education Coordinator; all of the Minnesota State Department of Education. They have also been approved by the Office of Gifted Education of the Federal Department of Health, Education, and Welfare which has provided the financial grant for the project.

MINNESOTA TALENTED YOUTH MATH PROJECT

CHAPTER THREE: EDU 40-59 CLASSIFICATION FOR STATE AIDS, SPECIAL REQUIREMENTS FOR SECONDARY SCHOOLS

(aa) Junior secondary period. Minimum clock hours for Mathematics is 360.

The MTYMP will meet this requirement in the following manner:

1. Seventh graders who take the fast-paced math class will have 60 hours of this class in 1976-1977 in addition to 120 hours of guided independent study in math or computer courses or other specially designed math class during the 1976-1977 school year.

   During 1977-78 students will take advanced math class for 145 hours per year.

   Most of these MTYMP students could be expected to take a full year of advanced mathematics during the 1978-1979 school year.

TOTAL 470 hours

2. Eighth graders who take the MTYMP fast-paced class will have completed 145 hours in 1975-1976 in the seventh grade and will have 60 hours of the fast-paced class in 1976-1977 plus 120 hours of guided independent study in math or computer courses, etc., during 1976-1977. In addition, these students will be expected to take an advanced class during their 9th grade.

TOTAL 465 hours

3. Ninth graders who take the MTYMP fast-paced class will have completed 290 hours of math before taking the fast-paced and independent study classes during 1976-1977.

TOTAL 470 hours

Please note: Typical class offering in Minnesota schools is 145 hours (based on 175 fifty-minute periods.)

MINNESOTA TALENTED YOUTH MATH PROJECT

POLICY GUIDELINES FOR PARENTS AND STUDENTS

1. Classes are available to the fifty highest scoring students in the Metropolitan area who participate in the Minnesota Math Talent Search. Fifty alternates will be selected for the project on the basis of their test scores in the Search.

2. The two fast-paced classes in the Metropolitan area will meet two hours per week for thirty weeks through June 4, 1977, with a two-week break during December 18 and January 3, 1977. A one-week break will be during the spring between April 2 and April 11.

3. Classes are not for enrichment but are designed for credit. Students are expected to attend all of the class sessions and complete all assignments in order to successfully complete the planned math sequence for credit.

4. Participation in the program is voluntary.

5. Students' home schools will provide time or class for homework completion, additional math work in independent study or other related mathematics materials, etc., during the regular school day in lieu of his/her regular math class.

6. Program is for one year from October, 1976, to June, 1977.

7. Students can only qualify for program by taking the SCAT verbal and nonverbal tests, Series 2, Level 2 which will be given on October 2 in the Metropolitan area and on October 16 in the Duluth area. Eligibility for taking this SCAT test is earning a score of 97%ile or above in any in-grade, in-school standardized mathematics test, i.e., IOWA, SRA, etc. Students do not need to have a composite math score of 97%ile to qualify - a 97%ile in any one math test is sufficient.

8. Not only will schools provide alternative math opportunities during the school year for students in the MTYMP, but schools will also provide alternative mathematics programming for these students next year and the years after that. These arrangements will be made jointly by the school and the MTYM Project.

9. The students who are eligible for the program are those public and private youngsters in grades 7, 8, and 9 if they have not completed Algebra I.

10. Fast-paced math classes conducted by the Minnesota Talented Youth Math Project are approved and sanctioned by Edmund Lee, Director of Secondary Education; David Dye, Coordinator of Math Education; and Lorraine Hertz, Gifted Education Coordinator; all of the Minnesota State Department of Education. The MTYMP has been approved and has been funded by the Office of Gifted Education of the Department of Health, Education and Welfare in Washington, D.C.

Appendix C

Communications

C-1: Call for Teachers

C-2: Call for Talent Search Participants

C-3: Letters to Parents and Pupils

C-4: Letters to School Administrators

C-5: Parent Consent Forms

C-6: Home School Option Forms

C-7: Student Progress Reports

State of Minnesota

Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

IMPORTANT NOTICE

POSITIONS AVAILABLE FOR THREE SECONDARY TEACHERS
TO TEACH TWO HOURS PER WEEK IN THE 1976-1977
MINNESOTA TALENTED YOUTH MATH PROJECT

TWIN CITIES METROPOLITAN AREA POSITIONS

Lorraine Hertz, Gifted Education Coordinator, has received a federal grant to develop and implement fast-paced math classes for junior high students who possess superior mathematics ability. Following a Minnesota Math Talent Search which will be held on Saturday, October 2, the top seventy-five students in the Twin Cities and Duluth Metropolitan areas will be invited to participate in one of three special two-hour, once a week, fast-paced math classes. These classes will be held after school, at night, or on Saturdays, depending on the desires of the teachers hired. Two of the classes will be held in the Twin Cities Metropolitan area, and one in the Duluth area.

The advisory committee for the Minnesota Talented Youth Math Project has determined criteria for selecting the teachers for the program. Members of the advisory committee are: Dr. Larry Annett, Curriculum Director, Duluth; Dr. Louis Cohen, president of the Minnesota Council of Mathematics Teachers, Bloomington; Themeo Ellis, Principal of Carl Sandburg Junior High, Robbinsdale; William George, Associate Director, Study of Mathematically Precocious Youth, John Hopkins University, Baltimore, Maryland; Dr. Lorraine Hertz, Dr. Peggy House, University of Minnesota; Casey Withers Humphries, Mathematics Resource Teacher, East Area, Minneapolis; Charles Lund, Math Supervisor, St. Paul; and Sally Sloan, Computer Resource Teacher, Minneapolis.

RECOMMENDED QUALIFICATIONS FOR TEACHERS IN THE MINNESOTA TALENTED YOUTH MATH PROJECT

1. Successfully experienced in a variety of secondary math positions and possessing the ability to use several different instructional methods.

2. Enthusiastic about teaching mathematics, not threatened by bright and talented youngsters, and strongly motivated intellectually.

3. Desire to spend the time required to perform the job.

4. Ability to teach a mathematics curriculum which may well include Algebra I, Algebra II, and plane geometry in approximately 60 hours.

5. Knowledgeable about available math resource people and curriculum materials and possessing the ability to successfully tap those resources.

6. Experienced in teaching mathematically talented students and possessing the ability to relate to these students.

PAY SCALE: $50 per two hour class

PERIOD OF APPOINTMENT: October, 1976 to or through June, 1977

ANY PERSON INTERESTED IN APPLYING FOR ONE OF THESE TEACHING POSITIONS SHOULD IMMEDIATELY SEND THEIR RESUME BEFORE SEPTEMBER 27, 1976, TO STEVE WATSON, MTYM PROJECT DIRECTOR, CENTRAL HIGH SCHOOL, 275 N. LEXINGTON PARKWAY, ST. PAUL, MN 55104.

AN EQUAL OPPORTUNITY EMPLOYER

State of Minnesota

Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

IMPORTANT NOTICE

POSITION AVAILABLE FOR ONE SECONDARY TEACHER
TO TEACH TWO HOURS PER WEEK IN THE 1976-1977
MINNESOTA TALENTED YOUTH MATH PROJECT

DULUTH AREA POSITION

The Minnesota State Department of Education has received a federal grant to develop and implement fast-paced math classes for junior high students who possess superior mathematics ability. Following a Minnesota Math Talent Search which will be held on Saturday, October 16, the top twenty-five students in the Duluth area will be invited to participate in a special two-hour, once a week, fast-paced math class. This class will be held after school, at night, or on Saturdays, depending on the preference of the teacher hired.

The advisory committee for the Minnesota Talented Youth Math Project has determined criteria for selecting the teachers for the program. Members of the state-wide advisory committee are: Dr. Larry Annett, Curriculum Director, Duluth; Dr. Louis Cohen, president of the Minnesota Council of Mathematics Teachers, Bloomington; David Dye, MSDE Math Coordinator; Themeo Ellis, principal of Carl Sandburg Junior High, Robbinsdale; William George, Associate Director, Study of Mathematically Precocious Youth, Johns Hopkins University, Baltimore, Maryland; Lorraine Hertz, Dr. Peggy House, University of Minnesota; Casey Withers Humphries, Mathematics Resource Teacher, East Area, Minneapolis; Charles Lund, Math Supervisor, St. Paul; Sally Sloan, Computer Resource Teacher, Minneapolis; and Steven Watson, St. Paul.

The Duluth area advisory committee is made up of Dr. Annett, Dr. John Hanson, Superintendent of Esko Public Schools, and James Zak, math teacher, Cloquet Junior High.

RECOMMENDED QUALIFICATIONS FOR TEACHERS IN THE MINNESOTA TALENTED YOUTH MATH PROJECT

1. Successfully experienced in a variety of secondary math positions and possessing the ability to use several different instructional methods.

2. Enthusiastic about teaching mathematics, not threatened by bright and talented youngsters, and strongly motivated intellectually.

3. Desire to spend the time required to perform the job.

4. Ability to teach a mathematics curriculum which may well include Algebra I, Algebra II, and plain geometry in approximately 60 hours.

5. Knowledgeable about available math resource people and curriculum materials and possessing the ability to successfully tap those resources.

6. Experienced in teaching mathematically talented students and possessing the ability to relate to these students.

PAY SCALE: $50 per two hour class

PERIOD OF APPOINTMENT: October, 1976 to or through June, 1977

AN EQUAL OPPORTUNITY EMPLOYER

ANY PERSON INTERESTED IN APPLYING FOR ONE OF THESE TEACHING POSITIONS SHOULD IMMEDIATELY SEND THEIR RESUME BEFORE OCTOBER 14, 1976, TO DR. LARRY ANNETT, CURRICULUM DIRECTOR, DULUTH PUBLIC SCHOOLS, BOARD OF EDUCATION BUILDING, DULUTH, MN 55802

IMPORTANT NOTICE TO JUNIOR HIGH MATH TEACHERS

THE FIRST ANNUAL MINNESOTA MATH TALENT SEARCH WILL BE HELD ON SATURDAY, OCTOBER 2, 1976

TIME: 10:00 - 11:30 A.M.
PLACE: Bridgeman Hall
DIRECTIONS: Take the Snelling exit from I94. Go north about one mile past the stop lights at University Avenue, Thomas Avenue and Minnehaha Avenue. Turn east on Englewood and drive for one block. You will see to the north an old brick building with a bell tower, which is called Old Main. Bridgeman Hall is the second floor of Old Main.

PLEASE URGE ALL OF THE STUDENTS YOU KNOW WHO HAVE PERCENTILE SCORES OF 97 OR ABOVE IN ANY RECENT STANDARDIZED MATH ACHIEVEMENT TEST AND WHO HAVE NOT COMPLETED ALGEBRA I TO ENTER THE MINNESOTA MATH TALENT SEARCH. THEY WILL BE GIVEN THE SCAT QUANTITATIVE AND VERBAL TESTS IN ORDER TO DETERMINE THE FIFTY MOST OUTSTANDING MATH STUDENTS IN GRADES SEVEN, EIGHT, AND NINE IN THE TWIN CITIES METROPOLITAN AREA.

IN ADDITION TO RECOGNITION FOR THEIR ACHIEVEMENT, THE MINNESOTA MATH TALENT SEARCH WINNERS WILL BE INVITED TO PARTICIPATE IN A SPECIAL FAST-PACED MATHEMATICS PROGRAM WHICH WILL BE HELD AT HAMLINE UNIVERSITY ON SATURDAYS OR AFTER SCHOOL DURING THE 1976-1977 SCHOOL YEAR. ARRANGEMENTS CAN BE MADE SO THAT SUCCESSFUL COMPLETION OF THIS PROGRAM WILL BE SUBSTITUTED FOR REGULAR JUNIOR HIGH MATH CLASSES. THIS WILL ENABLE HIGHLY TALENTED MATH STUDENTS TO MOVE AT THE PACE AND DEPTH WHICH IS APPROPRIATE FOR THEIR EXTRAORDINARY ABILITY.

APPLICATION FORM FOR MINNESOTA MATH TALENT SEARCH

Return to Steve Watson, Project Director, Central High School, 275 N. Lexington Parkway, St. Paul, 55104, BEFORE September 28, 1976.

Student's Name _____ Address _____

School _____ Grade _____ Math Teacher _____

Name of Math Achievement Test _____

Score (in percentiles) _____ Date Taken _____

School Counselor _____ School Telephone _____

When this application is received it means we will expect you at Hamline University on October 2, 1976. There is no charge for the Minnesota Math Test or the course. If you have any questions please contact:

Lorraine Hertz
296-4072

IMPORTANT NOTICE TO JUNIOR HIGH COUNSELORS

THE FIRST ANNUAL MINNESOTA MATH TALENT SEARCH WILL BE HELD ON SATURDAY, OCTOBER 2, 1976

TIME: 10:00 - 11:30 A.M.
PLACE: Bridgeman Hall
DIRECTIONS: Take the Snelling exit from I94. Go north about one mile past the stop lights at University Avenue, Thomas Avenue and Minnehaha Avenue. Turn east on Englewood and drive for one block. You will see to the north an old brick building with a bell tower, which is called Old Main. Bridgeman Hall is the second floor of Old Main.

PLEASE URGE ALL OF THE STUDENTS YOU KNOW WHO HAVE PERCENTILE SCORES OF 97 OR ABOVE IN ANY RECENT STANDARDIZED MATH ACHIEVEMENT TEST AND WHO HAVE NOT COMPLETED ALGEBRA I TO ENTER THE MINNESOTA MATH TALENT SEARCH. THEY WILL BE GIVEN THE SCAT QUANTITATIVE AND VERBAL TESTS IN ORDER TO DETERMINE THE FIFTY MOST OUTSTANDING MATH STUDENTS IN GRADES SEVEN, EIGHT, AND NINE IN THE TWIN CITIES METROPOLITAN AREA.

IN ADDITION TO RECOGNITION FOR THEIR ACHIEVEMENT, THE MINNESOTA MATH TALENT SEARCH WINNERS WILL BE INVITED TO PARTICIPATE IN A SPECIAL FAST-PACED MATHEMATICS PROGRAM WHICH WILL BE HELD AT HAMLINE UNIVERSITY ON SATURDAYS OR AFTER SCHOOL DURING THE 1976-1977 SCHOOL YEAR. ARRANGEMENTS STITUTED FOR REGULAR JUNIOR HIGH MATH CLASSES. THIS WILL ENABLE HIGHLY TALENTED MATH STUDENTS TO MOVE AT THE PACE AND DEPTH WHICH IS APPROPRIATE FOR THEIR EXTRAORDINARY ABILITY.

APPLICATION FORM FOR MINNESOTA MATH TALENT SEARCH

Return to Steve Watson, Project Director, Central High School, 275 N. Lexington Parkway, St. Paul, 55104 BEFORE September 28, 1976.

Students Name _____ Address _____

School _____ Grade _____ Math Teacher _____

Name of Math Achievement Test _____

Score (in percentiles) _____ Date Taken _____

School Counselor _____ School Telephone _____

When this application is received it means we will expect you at Hamline University on October 2, 1976. There is no charge for the Minnesota Math Test or the course. If you have any questions, please contact:

Lorraine Hertz
296-4072

IMPORTANT NOTICE TO JUNIOR HIGH MATH TEACHERS

THE FIRST ANNUAL MINNESOTA MATH TALENT SEARCH WILL BE HELD ON SATURDAY, OCTOBER 16, 1976 FOR STUDENTS IN THE DULUTH AREA.

TIME: 10:00 - 11:30 A.M., October 16, 1976
PLACE: Room 102, Social Science Building, University of Minnesota at Duluth
DIRECTIONS: Take Woodland Avenue to St. Marie Street, turn west and follow it through. You will pass University Methodist Church, go into the second drive leading to a parking lot onto Oakland Avenue and turn south. Parking spaces will not be ticketed if car is parked in general area. Walk down Oakland Avenue to Kirby Center. Take the first door under the concourse. Go down two flights of stairs and turn left to Room 102.

The Minnesota State Department of Education has received a federal grant to develop and implement fast-paced math classes for junior high students who possess superior mathematics ability. Following two Minnesota Math Talent Searches, the top seventy-five students will be invited to participate in one of three special two-hour, once a week, fast-paced math classes. These classes will be held after school, at night, or on Saturdays, depending on the mutual convenience of the teachers and students. Two of the classes will be held in the Twin Cities Metropolitan area and one in the Duluth area.

The Duluth Area advisory committee for the project is composed of Steven Watson, St. Paul, Minnesota Talented Youth Math Project Director; Lorraine Hertz, Gifted Education Coordinator for the Minnesota State Department of Education; David Dye, Math Coordinator, Minnesota State Department of Education; Dr. Larry Annett, Curriculum Director, Duluth; Dr. John Hanson, Superintendent of Esko Public Schools; and Jim Zak Math Teacher in the Cloquet Junior High School.

PLEASE URGE ALL OF THE STUDENTS YOU KNOW WHO HAVE PERCENTILE SCORES OF 97 OR ABOVE IN ANY RECENT STANDARDIZED MATH ACHIEVEMENT TEST AND WHO HAVE NOT COMPLETED ALGEBRA I TO ENTER THE MINNESOTA MATH TALENT SEARCH. THEY WILL BE GIVEN THE SCAT QUANTITATIVE AND VERBAL TESTS IN ORDER TO DETERMINE THE 25 MOST OUTSTANDING MATH STUDENTS IN GRADES SEVEN, EIGHT, AND NINE IN THE DULUTH AREA.

IN ADDITION TO RECOGNITION FOR THEIR ACHIEVEMENT, THE MINNESOTA MATH TALENT SEARCH WINNERS WILL BE INVITED TO PARTICIPATE IN A SPECIAL FAST-PACED MATHEMATICS PROGRAM WHICH WILL BE HELD AT U OF M DULUTH ON SATURDAYS OR AFTER SCHOOL DURING THE 1976-1977 SCHOOL YEAR. ARRANGEMENTS CAN BE MADE SO THAT SUCCESSFUL COMPLETION OF PROGRAM WILL BE SUBSTITUTED FOR REGULAR JUNIOR HIGH MATH CLASSES. THIS WILL ENABLE HIGHLY TALENTED MATH STUDENTS TO MOVE AT THE PACE AND DEPTH WHICH IS APPROPRIATE FOR THEIR EXTRAORDINARY ABILITY.

THERE IS NO CHARGE TO THE STUDENTS FOR THE TEST OR FOR THE FAST-PACED MATHEMATICS CLASS.

COMPLETION OF THE ATTACHED APPLICATION FORM RESERVES A PLACE FOR THE STUDENT AT THE MINNESOTA MATH TALENT SEARCH ON OCTOBER 16. THE STUDENT WILL BE EXPECTED TO BE PRESENT ON SATURDAY, OCTOBER 16 AT 10:00 A.M. IN ROOM 102 OF THE SOCIAL SCIENCE BUILDING.

APPLICATION FORM FOR MINNESOTA MATH TALENT SEARCH

Return to Dr. Larry Annett, Curriculum Director, Duluth Public Schools, Board of Education Building, Duluth, MN 55802, before October 11, 1976.

Student's Name _____ Address _____

School _____ Grade _____ Math Teacher _____

Name of Math Achievement Test _____

Score (in percentiles) _____ Date Taken _____

School Counselor _____ School Telephone _____

State of Minnesota

Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

October 12, 1976

Dear Student:

You and your family should feel proud that you were chosen by your school to participate in the first annual Minnesota Math Talent Search which was held on October 2 and October 7 at Hamline University. Students chosen for the search had to have scores of 97th percentile or above on a standardized mathematics achievement test which had been previously given by your school. This means that out of every 100 students who took that test, 97 students had scores the same as or less than your score.

It is a pleasure for us to inform you that you have been selected as one of the alternates for participation in the first annual Minnesota Talented Youth Mathematics Project (MTYMP) fast-paced math classes which will be held at Hamline University. This alternate status means that you are eligible to participate in one of the classes if an opening occurs, based upon a ranking with the other alternates of your test scores.

Again, congratulations on being chosen one of the alternates for participation in this special math project. If an opening occurs, you will be informed within two weeks.

Your school crunselor has been sent the scores you achieved in this test. If you wish to find out how you scored, please contact your counselor.

It is obvious that your test performance indicates your superior math ability. We encourage you to pursue a higher mathematics program throughout your secondary school years and beyond high school.

Sincerely yours,

Steve Watson, Project Director
645-9217, Ext. 9

SW:ltc

Minnesota Talented Youth Math Project Advisory Committee

Dr. Larry Annett, Curriculum Director, Duluth Public Schools
Dr. Louis Cohen, President, Minnesota Council of Teachers of Mathematics
David Dye, Coordinator of Math Education, Minn. State Dept. of Education
Themeo Eddis, Principal, Carl Sandberg Junior High, Robbinsdale
William George, Associate Director, Study of Mathematically Precocious Youth, Johns Hopkins University, Baltimore
Lorraine Hertz, Gifted Education Coordinator, Minn. State Dept. of Education
Dr. Peggy House, Assistant Professor of Math Education, Minneapolis Public Schools
Dr. Daniel Keating, Assistant Professor, Institute of Child Development, University of Minnesota
Charles Lund, Math Supervisor, St. Paul Public Schools
Sally Sloan, Computer Resource Teacher, Minneapolis Public Schools
Jan Wahl, Curriculum Committee, St. Paul-Minneapolis Archdiocese

AN EQUAL OPPORTUNITY EMPLOYER

State of Minnesota | Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

October 12, 1976

Dear

Thank you for the referral of the students that you made for the first annual Minnesota Math Talent Search, which was held Saturday, October 2, and Thursday, October 7. The list below includes the verbal score (number correct out of 50 possible items), and the quantitative score (number correct out of 50 possible items on the SCAT test) for each one of your students who took the test. Enclosed is the standardized test norms for 9th grade-spring/10th grade-fall students. (Chart #14.)

Your cooperation and assistance in making the first Talent Search a great success is clearly evident by the more than 500 young people who took the SCAT 2A test. More than fifty students scored 46 or better on the math portion of the exam. We feel that is quite an accomplishment for these youngsters. It is also a tribute to the home schools' math programs. You should be proud of your students who took the exam. Each student who took the exam, and the students who either qualified for the two special fast-paced math classes or who are alternates, have all been notified individually, by mail. We suggested to them that they contact you for their scores and an interpretation of those scores.

If you have any questions concerning these scores, please call Mr. Steven Watson, MTYMP Director, at St. Paul Central High School, 645-9217, Ext. 9.

Respectfully yours,

Steven R. Watson
MTYMP Director

SRW:ltc

Enc.

Minnesota Talented Youth Math Project Advisory Committee

Dr. Larry Annett, Curriculum Director, Duluth Public Schools
Dr. Louis Cohen, President, Minnesota Council of Teachers of Mathematics
David Dye, Coordinator of Math Education, Minn. State Dept. of Education
Themeo Eddis, Principal, Carl Sandburg Junior High, Robbinsdale
William George, Assoc. Dir., Study of Mathematically Precocious Youth, Johns Hopkins University, Baltimore
Lorraine Hertz, Gifted Education Coordinator, Minn. State Dept. of Education
Dr. Peggy House, Assistant Professor of Math Education, Univ. of Minnesota
Casey Withers Humphreys, Math Resource Teacher, Minneapolis Public Schools
Dr. Daniel Keating, Assistant Professor, University of Minnesota
Charles Lund, Math Supervisor, St. Paul Public Schools
Sally Sloan, Computer Resource Teacher, Minneapolis Public Schools
Jan Wahl, Curriculum Committee, St. Paul-Minneapolis Archdiocese

AN EQUAL OPPORTUNITY EMPLOYER

State of Minnesota

Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

I give my consent for my son/daughter, _____ (name), to participate in the Minnesota Talented Youth Math Project during 1976-77. I understand that he/she will be expected to attend a weekly mathematics class (to be held at Hamline University) and to complete the mathematics assignments made by the class instructor. The content of this special mathematics class will be equivalent to high school Algebra I and Algebra II.

In addition, I understand that my son/daughter will be expected to complete the following assessments:

a. Mathematics tests and quizzes given by the teacher on a regular basis

b. Nationally standardized tests of Algebra I and Algebra II which will help to determine whether he/she has earned high school credit for the course

c. Assessment of his/her attitude toward mathematics, toward his/her ability to learn mathematics, and toward the special Minnesota Talented Youth Math Class.

This information will enable the project director to evaluate the effectiveness of the MTYMP and to make recommendations for future programs. In addition, I understand that the information resulting from the above evaluations will be kept confidential and that no individual will ever be personally identified in any reports or publications without his/her expressed written consent. However, individual scores or any of the above measures will be available to the student and his/her parents upon request.

Finally, I understand that I am encouraged to ask the project director, the advisory committee members and the instructor any questions I may have about the project of its procedures. Also I understand that I may withdraw my child from the project at any time without prejudice.

Signed _____ Date _____

AN EQUAL OPPORTUNITY EMPLOYER

State of Minnesota

Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

MINNESOTA TALENTED YOUTH MATH PROJECT

STUDENT OPTION FORM

_____ Date

Student's Name _____ Grade _____

School _____ Address _____

Math Teacher _____ Counselor _____

PLEASE CHECK ONE OR MORE OF THE FOLLOWING OPTIONS THAT THIS STUDENT WILL BE OFFERED BY HIS/HER HOME SCHOOL DURING THE 1976/77 SCHOOL YEAR.

____ 1. Student remains in regular math class, is not required to do regular math, but time is used to do MTYMP home work. Math teacher provides necessary tutorial help.

____ 2. Student does not attend regular math class, studies MTYMP math independently in specially designated study area during his/her regularly scheduled math period. Math teacher provides necessary tutorial help.

____ 3. Student and teacher arrange special independent math project to be studied during regularly scheduled math class.

____ 4. School provides student with option of taking computer math class or other math enrichment class(es) during regularly scheduled math class. What class would this be? _____

Signed _____ Teacher

_____ Principal

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MINNESOTA TALENTED YOUTH MATHEMATICS PROJECT

PROGRESS REPORT

HAMLINE UNIVERSITY - TWIN CITIES' CLASSES

Name of Student Times Present Times Absent Date

I. Topics Covered

The following topics have been covered from October 28, 1976, through January 13, 1977.

1. simplifying algebraic expressions
2. solving linear equations with one variable
3. solving linear inequalities with one variable
4. simplifying polynomial expressions
5. multiplying binomials
6. factoring polynomials
7. solving quadratic equations without use of quadratic formula
8. graphing lines from equations, two points, and slope-intercept methods
9. finding equations from graphs, two points, and slope-intercept methods

Currently we are studying functions, systems of linear equations and inequalities.

II. Behaviors

The following items represent behaviors that may indicate progress or adjustment over nine class sessions. Due to limited associations value judgment is a big factor, and the results should be viewed as a whole. The items are checked on a continuum.

Never	Always	
_____		Completes assignments regularly.
_____		Pays attention when material is being presented by the teacher or other students.
_____		Participates regulary in class discussions.
_____		Follows directions.
_____		Appears to be happy.
_____		Appears to be learning.

III. Academic Progress

Examinations	Pass	Unsatisfactory
Homework	Pass	Unsatisfactory
Grade	____	Unsatisfactory

IV. Comments

In the Grade 9 section the Minneapolis Public Schools' Minimum Essentials Test for Elementary Algebra-Semester One was administered as a pre-test for diagnostic purposes and as a post-test for achievement purposes. A score of thirty-six items correct out of a possible forty-five items on that test is considered pass. Your child scored _____ on the pre-test on November 4 and _____ on the post-test on December 16.

If you have any comments or questions, please call. I will be happy to discuss the evaluation.

_____

Teacher's Signature

Staff

Steve Watson, Director, Central High School, St. Paul, 645-9217
Eunice Kanning, Teacher, Central High School, Minneapolis, 822-3141
Larry Luck, Teacher, Edison High School, Minneapolis, 789-8826
Steve Rosenberg, Teaching Assistant, Minneapolis, 336-0901
Clare Bishoff, Teaching Assistant, Edison High School, 788-8826

MINNESOTA TALENTED YOUTH MATHEMATICS PROJECT
PROGRESS REPORT II
SESSIONS 11-22
HAMLINE UNIVERSITY - TWIN CITIES' CLASSES

Name of Student Times Present Times Absent Date

I. Topics Covered

The following topics have been covered from January 20, 1977 through April 24, 1977, the twenty-second session.

1. solving absolute value relationships with one or two variables
2. solving two equations in two variables by substitution, addition, and graphing
3. solving three equations in three variables by substitution and matrices
4. solving two equations in three variables
5. solving systems of linear inequalities by graphing and finding the extreme points
6. the Pythagorean Theorem
7. operations involving squares, radicals, square roots and simplifying
8. graphing and transforming quadratic functions of the form $f(x)=a(x - h)2+k$
9. solving equations by factoring, completing the square and the quadratic formula
10. using the distance formula
11. solving and graphing equations of conic sections
12. operations with complex numbers
13. solving ratio, proportion, and rational expression problems
14. scientific notation, exponential and logarithmic functions

Currently we are studying trigonometry. After that we shall be studying sequences and series. Time permitting we will be studying probability, matricies and determinants, and circular functions. The last class is scheduled for Thursday, June 2, 1977.

II. Behaviors

The following items represent behaviors that may indicate progress or adjustment over nine class sessions. Due to limited associations value judgement is a big factor, and the results should be viewed as a whole. The times are checked on a continuum.

Never Always

_____ Completes assignments regularly.

_____ Pays attention when material is being presented by the teacher or other students.

_____ Participates regularly in class discussions.

_____ Follows directions.

_____ Appears to be happy.

_____ Appears to be learning.

III. Academic Progress

Examinations	Pass	Unsatisfactory
Homework	Pass	Unsatisfactory
Grade	____	Unsatisfactory

IV. Comments

The Minneapolis Public Schools' Minimum Essentials Test for Elementary Algebra-Semester Two was administered for achievement purposes. A score of thirty-six items correct out of a possible forty-five items on that test is considered pass. Your child scored _____ on the test on March 24.

The Cooperative Mathematics Test-Algebra I was administered for achievement purposes. A score of 30 out of 40, 88th percentile on the national norms, is needed to earn credit for Algebra I.

Your child scored _____ correct out of 40 on the test on April , 1977.

If you have any comments or questions please call. The staff has been pleased with the progress of the course and with the cooperation of the students, parents, and home school personnel.

Teacher's Signature

Staff

Steve Watson, Director, Central High School, St. Paul, 645-9217

Eunice Kanning, Teacher, Central High School, Minneapolis, 822-3141

Larry Luck, Teacher, Edison High School, Minneapolis, 789-8826

Steve Rosenberg, Teaching Assistant, Minneapolis, 336-0901

Clare Bishoff, Teaching Assistant, Edison High School, 788-8826

State of Minnesota

Department of Education
Capitol Square, 550 Cedar Street
St. Paul, Minnesota 55101

June 3, 1977

Dear

The first Minnesota Talented Youth Mathematics Project (MTYMP) concluded classes on Thursday, June 2, 1977. After thirty two-hour classes the 65 outstanding 7th, 8th, and 9th grade students completed Algebra I and Algebra II. Each student was given the Cooperative Mathematics Test for Algebra I and Algebra II, to determine the granting of credit. Under the Minnesota State Department of Education and the MTYMP Advisory Committee guidelines for the program, a student had to score at the 88th percentile or above on the Cooperative examinations to earn credit in the two algebras. One full year of high school mathematics credit is to be granted each course that is completed (total of two years of higher mathematics) to the student upon successful completion of the fast-paced MTYMP classes.

The student(s) scored as follows on the two standardized tests, as given below:

Student name _____ grade _____

1. Cooperative Mathematics - Algebra I - Test

   _____ correct out of 40 items

   _____ percentile score

2. Cooperative Mathematics - Algebra II - Test

   _____ correct out of 40 items

   _____ percentile score

	Credit earned	Credit not earned	
3.	_____	_____	Algebra I (1 Full Year)
4.	_____	_____	Algebra II (1 Full Year)

On behalf of the students, parents, staff, and advisory committee, I want to thank you for helping to make this first MTYMP a great success. Your help made it possible to offer this accelerated program to the Twin City and Duluth metropolitan area.

The program has been refunded for next year, 1977-78, and 41 students from this year's program will continue on to study plane and analytical geometry and trigonometry. An additional new class will be offered in the Twin Cities for 25 outstanding 7th and 8th grade students. Information about a second Minnesota Mathematics Talent Search will be sent to your school in August.

Again, my thanks to you for your support of the MTYMP.

If you have any questions or need further information, please contact me at 645-9217.

Respectfully,

Steven R. Watson, Director
Minnesota Talented Youth Mathematics Project

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Appendix D

Home Schools of MTYMP Participants

Twin Cities Area Schools

School	District	Number of Participants
Assumption	Archdiocese of St. Paul-Mpls.	1
Central Middle School	Eden Prairie	2
Columbia Junior High	Columbia Heights	2
Coon Rapids Junior High	Anoka-Hennepin	1
East Junior High	Richfield	4
Fairview Junior High	Roseville	3
F. M. Grass Junior High	West St. Paul	2
Fridley Junior High	Fridley	2
Highland Park Junior High	St. Paul	2
Hillside Junior High	North St. Paul	1
Johanna Junior High	Mounds View	6
Lakeville Middle School	Lakeville	1
Maplewood Junior High	North St. Paul	1
Murray Junior High	St. Paul	2
Nativity	Archdiocese of St. Paul-Mpls.	1
Osseo Junior High	Osseo	2
Penn Junior High	Bloomington	3
Plymouth Junior High	Robbinsdale	1
Portland Junior High	Bloomington	4
St. Luke	Archdiocese of St. Paul-Mpls.	1
St. Paul Park Junior High	South Washington County	1
St. Pius X	Archdiocese of St. Paul-Mpls.	1
Sunrise Park Junior High	White Bear Lake	3
Westwood Junior High	Spring Lake Park	1

Duluth Area Schools

School	Number of Participants
Cloquet Junior High	2
Esko Junior High	1
Holy Rosary	1
Minnehaha	2
Morgan Park	1
Ordean	4
Washington	1
West Junior High	1
Woodland	4